



EFFECTIVENESS HYDROGEL PLASTER OF KIRINYUH AND PALM EMPTY FRUIT BUNCHES AS AN ANTI-INFLAMMATORY CUT WOUND

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ABSTRACT

Urgency of this research is that the use of non-steroidal drugs often causes gastrointestinal irritation, while non-steroidal drugs often cause side effects that disrupt growth and the immune system. Long-term use of these medications has potential to cause side effects. Important to find alternative treatments that can prevent these side effects. Reducing inflammation and speeding up wound healing requires appropriate healing methods, one of which is using a wound dressing containing anti-inflammatory properties. Development of a hydrogel wound dressing from palm empty fruit bunches waste as a substitute for hydrophilic hydrogel chemicals. This research not only tested the effectiveness of the hydrogel wound dressing but also reduced the problem of palm empty fruit bunches waste experienced by the community, particularly in North Sumatera specifically Asahan. The aim of this research was to determine the effectiveness of kirinyuh leaf extract and to utilize the cellulose content of palm empty fruit bunch waste as a hydrogel plaster as an anti-inflammatory for cuts. The research method used was experimental method, which includes sampling, preparation of kirinyuh leaf stem extract with concentrations of 4.6%, 5.6% and 6.6%, Preparation of cellulose extract 10%, phytochemical screening, hydrogel plaster evaluation test and anti-inflammatory test of hydrogel plaster on male rats (*Rattus norvegicus*) grouped into 5 groups. Statistical analysis includes one-way ANOVA to see there is a significant difference between concentrations in the healing of incisional wounds in male rats. The research showed that F1 (4.6% concentration) healed rat cuts on day 12, F2 (5.6% concentration) healed rat cuts on day 10, F3 (6.6% concentration) healed rat cuts on day 8, and the positive control (Dermafix T Plaster) healed rat cuts on day 6. Hydrogel plaster of kirinyuh leaf extract and palm empty fruit bunches are effective as anti-inflammatory agents for cuts in white rats (*Rattus norvegicus*).

Keywords: anti-inflammatory; cut wound; hydrogel plaster; kirinyuh leaf; palm empty fruit bunches

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INTRODUCTION

Utilization of traditional herbal plants is a first aid for treating wounds, one of which is cuts. Skin damage includes the epidermis and part of the dermis in the form of an inflammatory reaction accompanied by an exudation process (Anisa et al., 2019). Inflammation is usually treated using steroid and non-steroidal anti-inflammatory drugs (Pramitaningastuti & Anggraeny, 2017). Utilization of non-steroidal drugs often causes digestive tract irritation problems, while non-steroidal drugs often cause side effects such as growth and immune system disorders (Ulfa et al., 2016). Long-term use of medical drugs has the potential to cause side effects. Therefore, it is important to find alternative treatments that can prevent these side effects (Samodra & Kaaffah, 2024). The ideal wound dressing must have criteria including being impenetrable to microorganisms or being able to prevent the entry of microorganisms into the wound site. Therefore, the use of herbal plants with anti-inflammatory properties needs to be done as an alternative treatment with minimal side effects, such as kirinyuh (*Chromolaena odorata L.*) leaves

and palm empty fruit bunches for hydrogel plaster preparations for cut wound.

Kirinyuh (*Chromolaena odorata L.*) is one of the most useful traditional tropical medicinal plants for treating wounds, burns, diarrhea, coughs, colds, and toothaches. This plant has many pharmacological activities due to its phytochemical content, including activities such as antiulcer, antioxidant, anti-inflammatory, antihypertensive, antihyperglycemic, anticancer, and others (Jamatia et al., 2024).

Testing the inflammatory effects of topical ethanol extract of kirinyuh leaves can provide anti-inflammatory effects and affect the number of leukocyte cells in male white mice (Ifora et al., 2017). Other research only focuses on analyzing the healing activity of kirinyuh leaf extract on cuts without combining it with components that have the latest innovations (Efendi et al., 2023). Testing of palm empty fruit bunch hydrogel and butterfly pea flowers has proven to have anti-inflammatory effectiveness on burns, but the resulting gel is semi-liquid and has not been developed for cuts (Ramayani, 2025). In addition to utilizing herbal plants, an analysis was conducted on the potential of waste with anti-inflammatory properties in the environment to reduce environmental pollution. Waste that can be utilized is empty oil palm bunches.

The problem that arises in Asahan Regency due to the lack of waste utilization is the conflict between managers and the community (Ansori, 2025). Empty fruit bunches containing 44.4 percent cellulose, 30.9 percent hemicellulose, and 14.2 percent lignin have not been utilized optimally. Cellulose compounds are the main component of plant cell walls, where this type of compound is widely used as the main ingredient in the chemical industry such as food, pharmaceutical and medical, surfactants, emulsifiers, herbicides, and various other chemically modified products (Mokhtar et al., 2017).

Palm empty fruit bunch waste is the most produced solid waste, which is almost the same as the amount of palm oil production and is a breeding ground for flies (Pertiwi, 2021). Palm empty fruit bunches waste as a substitute for hydrophilic hydrogel chemicals (Tuan Mohamood et al., 2021). The aim of this research was to determine the effectiveness of kirinyuh leaf extract and to utilize the cellulose content of palm empty fruit bunch waste as a hydrogel plaster as an anti-inflammatory for cuts.

METHOD

The research method used was experimental method, which includes sampling, preparation of kirinyuh leaf stem extract with concentrations of 4,6%, 5,6% and 6,6%, phytochemical screening, hydrogel plaster evaluation test and anti-inflammatory test of hydrogel plaster on male rats (*Rattus norvegicus*) grouped in to 5 groups. Statistical analysis includes one-way ANOVA to see there is a significant difference between concentrations in the healing of incisional wounds in male rats.

Material

The material used in this research were kirinyuh leaf simplicia (*Chromolaena odorata L.*) obtained from the Durian street area, Asahan Reagecy, Medan, North Sumatera, 70% ethanol as a solvent, ethyl acetate, chlorofom, n-hexane, Mayer's reagent, FeCl₃, anisaldehyd, distilled water, dragendroff reagent, sitroborat, folin-ciocalteu reagent, gallic acid, Na₂CO₃, palm empty fruit bunches, NaOH, H₂O₂, Na-CMC, PEG 400, Nipagin, DMSO, gloves, mask, filter paper, gauze, cotton, nutrient agar media, male rats (*Rattus norvegicus*), and lidocain.

Preparation of extract

Samples were dried using a drying cabinet at a temperature of 40°C. Kirinyuh leaves simplicia was extracted by maceration using 70% ethanol as a solvent. Kirinyuh leaves simplicia powder were weighed 1200 grams then put into a maceration vessel using 12 L of ethanol solvent, then left for 3

x 24 hours stirring occasionally and protected from light. Extract was filtered using filter paper, then the filtrate was obtained, concentrated using rotary evaporator at temperature of 70°C and continued with thickening using a water bath at a temperature of 60°C until it became a thick extract. The results of the concentration were then tested for ethanol free and the extract yield was calculated.

Moisture Content Determination Test

The steam cup is put into a 100 degree Celsius oven for 30 minutes after that, cool it down, then the steam cup is put into a 100 degree Celsius oven for 30 minutes after that, cool it down but the 1st and 2nd methods must be constant or the same (if not the same, do it continuously until the same), after that, put the simplicia powder into a 100 degree Celsius oven for 1 hour after that, cool it down, then put the simplicia powder into a 100 degree Celsius oven for 1 hour after that, cool it down but the weight of the 4th and 5th methods must be constant or the same (if not the same, do it continuously until the same) (Zahidin et al., 2023).

The standardization of water content of kirinyuh leaves based on herbal pharmacopoeia II is below 10%.

$$\% \text{Water Content Determination} = \frac{\text{weight of simplicia} - (\text{constant weight of cup} + \text{dry material})}{(\text{constant weight of cup} + \text{dry material})} \times 100\%$$

Preparation of cellulose extract

Palm empty fruit bunches that have been dried in an oven are weighed as much as 400 grams. Extraction of palm empty fruit bunch cellulose is carried out in two main stages, namely delignification and bleaching. The delignification process is carried out by soaking 400 g of palm empty fruit bunch cellulose in 200 mL of NaOH solution heated with a Bunsen flame for 60 minutes to dissolve the lignin in the empty bunch fibers. Next, the palm empty fruit bunches cellulose is bleached. This process uses cellulose that has undergone a delignification process. The cellulose is washed thoroughly and left to dry until its water content reduces. Bleaching is carried out by soaking the cellulose in 100 mL of H₂O₂ solution heated over a Bunsen burner for 60 minutes. The cellulose extract is then dried and blended until it becomes very smooth (Ritonga et al., 2023).

Phytochemical Screening

Screening of kirinyuh leaf extract includes flavonoids, alkaloids, tannins, and saponins.

Preparation of Hydrogel Plaster

The making of hydrogel plaster begins with Na-CMC dissolved in distilled water at a temperature of 90°C, stir homogeneously, then set aside. 10% palm empty fruit bunches dissolved in distilled water at the same temperature (90°C) stir homogeneously then mix with dissolved Na-CMC, lower the temperature to below 50°C then add kirinyuh extract with various concentrations, namely extracts of 4.6%, 5.6% and 6.6% (Setyarani et al., 2025) and add the other ingredients one by one slowly and periodically (Nipagin (methylparaben), DMSO and Aquadest). Stir using a magnetic stirrer until homogeneous (Hanistya & Samlan, 2021).

Hydrogel Plaster Preparation Test

Organoleptic test

Analysis of texture, smell, color and homogeneity to physically determine a product.

Homogeneity Testing of Hydrogel Plaster

The homogeneity test is performed to determine whether the preparation is homogeneous. The ointment is applied to a transparent glass slide, dividing the preparation into three parts: the top, bottom, middle, and bottom. Homogeneity is indicated by the absence of coarse grains in the

preparation.

Thickness Test

The thickness of the preparation was measured using a Scrup Micrometer with an accuracy of 0.01 mm. The thickness of the plaster was measured with a micrometer at three points on each preparation, and the average thickness was calculated.

pH Test

Dissolve the hydrogel plaster in a Petri dish with 10 mL of distilled water. Measure the pH using a pH meter. Repeat this three times with different hydrogel plasters (Nurdianti, 2022).

Sterilization Test

Sterilization Test of Preparations in the IPPT USM Laboratory. Sterilization testing is performed using an autoclave. The Microbiology Safety Cabinet to be used for testing must first be sterilized by irradiating with UV light for 24 hours. Prepare 15 g of nutrient agar (NAoxid) in 500 ml of distilled water and bring to a boil while stirring continuously. After boiling, sterilize the medium in an autoclave at 121°C for 15 minutes. Pour the NA medium into sterile Petri dishes in the Microbiology Safety Cabinet and allow it to solidify. Sterility testing of the preparations is performed every 30 days. During testing, the hydrogel preparations are stored in a climatic chamber (memmert) at 40°C. d. For the pH test, the prepared preparation was placed in a porcelain dish containing 2 ml of distilled water (pH 6.5 ± 0.05) and allowed to stand for 2 hours at room temperature until it swelled. Universal pH paper was placed on the surface of the preparation to determine its pH value (Nabillah et al., 2022).

Anti-inflammatory Test

The test animals used in this study were 25 male Wistar rats (*Rattus norvegicus*) (sample determination for testing using the Federer formula), healthy, 2–3 months old, unmated, weighing 200–300 g. Each rat was divided into five groups for various concentrations and positive controls. Prior to testing, the rats were fasted for 6–18 hours with continued drinking water. Prior to treatment, the rats were acclimatized to the environment for 7 days. The fur on the backs of the animals was shaved until smooth, first on the backs, and then thoroughly cleaned with 70% alcohol. Before the procedure, the wounds were anesthetized subcutaneously in the thigh using lidocaine at 2 ml/kg body weight. 2 cm long and 2 mm deep incision was made using a caliper on the left back of the rats. The depth of the incision was marked with a scalpel using a 18-digit marker (Ardiani et al., 2025). Group 1 was the positive control group and was given the Dermafix T plaster. Group 2 was the negative control and received the hydrogel plaster without extract. Groups 3, 4, and 5 received 4.6%, 5.6%, and 6.6%, respectively.

Data Analysis

The data obtained from the research results were tested for normality using the Shapiro-Wilk test and for homogeneity using the Levene test. If the data were normal and homogeneous, a one-way ANOVA test was used, followed by a post-hoc LSD test with a significance level (α) of 0.05. If the data did not meet the parametric requirements (non-normal and/or non-homogeneous data), an alternative test, the Kruskal-Wallis test, was used, followed by the Mann-Whitney test.

RESULT

Results of Extraction of kirinyuh leaves

Extracts were made using the maceration method. 1200 grams of kirinyuh leaf powder was soaked in 70% ethanol to obtain 136.4 grams of thick extract with a yield of 11.36%, and 1500 grams of empty palm fruit bunch powder was soaked in 70% ethanol to obtain 375.3 grams of thick extract with a yield of 25.02%.

Results of Moisture Content Determination

The kirinyuh leaf powder had a moisture content of 6.34%, while the empty oil palm fruit bunch

powder had a moisture content of 3.98%. These values meet the standard of <10%, making them resistant to microbial growth and resistant to long-term storage. The test results are shown in Table 1

Table 1.

Water Content Results

| Simplicia | % |
|--------------------------|------|
| Kirinyuh leaves | 6.34 |
| Palm empty fruit bunches | 3.98 |

Results of Cellulose extract

The results showed that the cellulose extract from palm empty fruit bunches had the best yield value during at 50.79 g, resulting in a higher cellulose content.

Results of Phytochemical Screening

Identification of compounds used to confirm the presence of anti-inflammatory properties can be seen in Table 2.

Table 2.

Chemical Content Examination of Kirinyuh Leaves Results

| Compound | Results | Conclusion |
|-----------|---------------------|------------|
| Alkaloid | White sediment | Positive |
| Flavonoid | Orange-yellow | Positive |
| Tanin | Blackish green | Positive |
| Phenol | Purple-blue | Positive |
| Saponin | 1 cm foam formation | Positive |

Phytochemical screening of kirinyuh leaf extract revealed the presence of flavonoids, alkaloids, saponins, tannins, and phenols. These results align with previous research.

Results of Making Hydrogel Plaster

The formulation of the kirinyuh leaf and palm empty fruit bunch extract hydrogel plaster preparation was made with several variations in the concentration of kirinyuh leaf and empty palm fruit bunch extracts of 4.6%, 5.6% and 6.6% then added other ingredients one by one slowly and periodically (methylparaben), DMSO and Aquadest) until 100gr then it was homogenized. The results of making hydrogel plaster preparations from the three formulations were homogeneous and formed hydrogel plasters.

Results of Hydrogel Plaster Preparation

Results of organoleptic observations of kirinyuh leaves

Organoleptic observations include observations of the shape, color, and odor of the hydrogel plaster preparation of kirinyuh leaf extract and empty oil palm bunches. Table 3 shows that each formula that has been observed for 28 days gave results that did not experience changes in color, odor, and shape and did not experience separation or heterogeneity. This indicates that the hydrogel plaster preparation is stable in storage. The test results are shown in Table 3.

Table 3.

Organoleptic Results of Hydrogel Plaster

| Formulation | Observation | Days | | | | |
|-------------|-------------|--------------|--------------|--------------|--------------|--------------|
| | | 0 | 7 | 14 | 21 | 28 |
| F0 | color | clear | clear | clear | clear | clear |
| | smell | odorless | odorless | odorless | odorless | odorless |
| | texture | thick | thick | thick | thick | thick |
| F1 | color | sea green | sea green | sea green | sea green | sea green |
| | smell | odorless | odorless | odorless | odorless | odorless |
| | texture | very thick | very thick | very thick | very thick | very thick |
| F2 | color | hunter green | hunter green | hunter green | hunter green | hunter green |
| | smell | odorless | odorless | odorless | odorless | odorless |

| Formulation | Observation | Days | | | | |
|------------------|-------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | | 0 | 7 | 14 | 21 | 28 |
| F3 | te xt ure | thick | thick | thick | thick | thick |
| | color | castle ton gre e n | castle ton gre e n | castle ton gre e n | castle ton gre e n | castle ton gre e n |
| | sme ll | odorle ss | odorle ss | odorle ss | odorle ss | odorle ss |
| | te xt ure | thick | thick | thick | thick | thick |
| Control positive | color | cle ar | cle ar | cle ar | cle ar | cle ar |
| | sme ll | odorle ss | odorle ss | odorle ss | odorle ss | odorle ss |
| | te xt ure | thick | thick | thick | thick | thick |

Description:

F0: Blanko

F1: 4.6% hydrogel plaster

F2: 5.6% hydrogel plaster

F3: 6.6% hydrogel plaster

Results of Homogeneity Testing of Hydrogel Preparations

Results of Homogeneity Testing of Hydrogel Preparations are shown in Table 4.

Table 4.

Homogeneity Testing Results

| Formulation | Weeks | | | Characteristics |
|------------------|---------------|---------------|---------------|-----------------|
| | 1 | 2 | 3 | |
| F0 | homoge ne ous | homoge ne ous | homoge ne ous | no change s |
| F1 | homoge ne ous | homoge ne ous | homoge ne ous | no change s |
| F2 | homoge ne ous | homoge ne ous | homoge ne ous | no change s |
| F3 | homoge ne ous | homoge ne ous | homoge ne ous | no change s |
| Control positive | homoge ne ous | homoge ne ous | homoge ne ous | no change s |

Results of Thickness Test

Hydrogel plaster thickness test results are shown in Table 5.

Table 5.

Hydrogel Plaster Thickness Test Results

| Formulation | Thickness ± SD | Specification | Characteristics |
|------------------|----------------|---------------|-----------------|
| F0 | 0,405 mm±0,012 | 0,4-0,7 | Suitabel |
| F1 | 0,463 mm±0,012 | | Suitabel |
| F2 | 0,571 mm±0,046 | | Suitabel |
| F3 | 0,624 mm±0,094 | | Suitabel |
| Control positive | 0,865 mm±0,094 | | Suitabel |

The thickness test of the hydrogel plaster was measured using a screw micrometer and gave results that could be categorized according to the characteristics, namely 0.4-0.7 mm and the standard deviation obtained from the average thickness of the hydrogel plaster was low.

Results of pH Test

Results of pH test are shown in Table 6.

Table 6.

pH Test Results

| Formulation | pH | Specification | Characteristics |
|------------------|----------------|---------------|-----------------|
| F0 | 2,63 | 4-6 | Suitabel |
| F1 | 4,52 | | Suitabel |
| F2 | 4,87 | | Suitabel |
| F3 | 5,66 | | Suitabel |
| Control positive | 0,865 mm±0,094 | | |

Results of Sterilization Test

Test results of hydrogel plaster preparations containing extracts of kirinyuh leaves and palm empty

fruit bunches against *Staphylococcus aureus* bacteria are shown in Table 7.

Table 7.
Sterilization Test Results

| Formulation | Days | | | average diameter of inhibition zone (mm) |
|------------------|----------|----------|----------|--|
| | 0 | 15 | 30 | |
| F0 | sterile* | moldy | moldy | 0 |
| F1 | sterile* | sterile* | sterile* | 4,98 |
| F2 | sterile* | sterile* | sterile* | 6,52 |
| F3 | sterile* | sterile* | sterile* | 10,36 |
| Control positive | sterile* | sterile* | sterile* | 20,12 |

*: no colonies of microorganism growth were found

Based on the results of the inhibition zone calculations observed in the media, the inhibition zone can be categorized as follows: an inhibition zone area of more than 20 mm is categorized as very strong antibacterial activity, between 11 and 20 mm is categorized as strong, 6 to 10 mm is categorized as moderate, and less than 5 mm is categorized as weak antibacterial activity.

Result of Anti-inflammatory Test

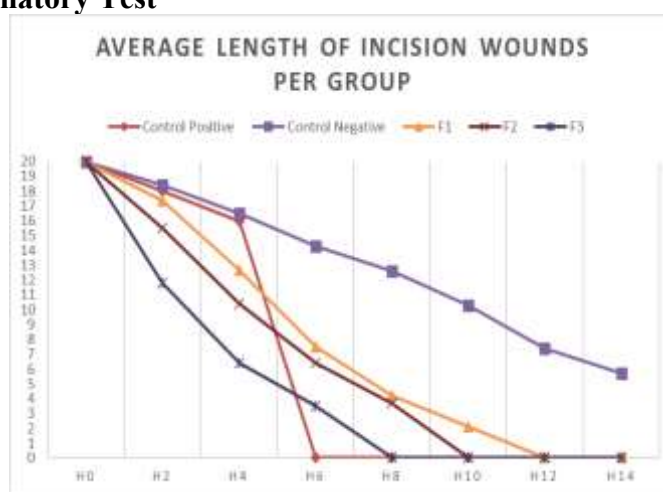


Figure 1. Average Length of Incision Wounds per Group

The results of measuring the length of the incision wound until it completely closed in the positive control group, the negative control group (blank), the 4.6% concentration group, the 5.6% concentration group, and the 6.6% concentration group. Data on the average change in wound length in each group shown in Figure 1.

Based on the test results, wound length measurements showed that all treatment groups experienced changes in wound length from day 1 to day 14. However, group F0 experienced a significantly slower healing process compared to the other groups due to the absence hydrogel plaster of kirinyuh leaf extract and palm empty fruit bunches. The graph above shows a reduction in the length of the incision wound with each treatment, which gradually healed from day 2 to day 14. Wound healing activity showed that F1 healed on day 12, F2 healed on day 10, F3 healed on day 8, the positive control healed on day 6, and the negative control healed on day 16, but scars remained until day 20. The results of this study indicate that kirinyuh leaf extract (*Chromolaena odorata L.*) and palm empty fruit bunches are effective as anti-inflammatory agents for incision wounds in male white rats (*Rattus norvegicus*).

Data Analysis

The results of data analysis are said to be normally distributed if the significance value is more than 0.05. The normality test using the Shapiro-Wilk test yielded a p-value greater than 0.05 for each group, thus concluding that the data distribution was normal. Furthermore, the homogeneity test in this study showed a p-value of 0.730 ($p > 0.05$), thus indicating that the data variance was

homogeneous. The results of the One-Way ANOVA analysis obtained a p-value of 0.000 (<0.05), indicating a significant difference in the length of the incision between the treatment groups. Based on the results of the Post Hoc test, it was found that most of the group pairs showed significant differences ($p < 0.05$) in the length of the incision, both between treatments and compared to the positive control. The positive control consistently showed the smallest incision length at each observation time, indicating the fastest healing process. The 6.6% hydrogel plaster had the closest healing effectiveness to the positive control and was statistically significantly different from the negative control, 4.6% hydrogel plaster, and 5.6% hydrogel plaster. The order of incision healing effectiveness from highest to lowest was Positive Control > 6.6% hydrogel plaster > 5.6% hydrogel plaster > 4.6% hydrogel plaster > Negative Control.

DISCUSSION

Cut wounds are prone to inflammation because commercial gel preparations are easily washed away by sweating, using non-steroidal medications, direct sunlight exposure, and without a dressing. Reducing inflammation in cut wounds and speeding up healing requires the right method, one of which is using a wound dressing containing anti-inflammatory agents. Kirinyuh leaves have a hemostatic effect, namely significant wound healing activity in mice and no irritation or allergies are produced (Li et al., 2024). Previous research shows that further research is needed on the effectiveness of kirinyuh leaf extract hydrogel on wound healing (Agung & Suban, 2024). Phytochemical tests of previous studies have shown that kirinyuh leaves contain secondary metabolite compounds, including: alkaloids, flavonoids, phenols, saponins, tannins, terpenoids, and steroids that act as anti-inflammatory, antibacterial, and antioxidant (Kanase & Shaikh, 2018). Phytochemical screening of the mango leaf ethanol extract was then performed to identify the secondary metabolites present in the extract. The active ingredient in the kirinyuh leaf extract is known to have anti-inflammatory and antibacterial properties, as well as accelerate tissue regeneration. The phytochemical screening of the mango leaf ethanol extract revealed the presence of alkaloids, flavonoids, tannins, and saponins. Flavonoids in mango leaves have several derivatives that play a role in wound healing.

Evaluation of hydrogel plaster preparations was carried out to determine the physical quality of the resulting preparation, including organoleptic tests, homogeneity, pH and adhesive strength. The results of organoleptic showed that each formula observed for 28 days showed no changes in color, odor, or shape, and no separation or heterogeneity. This indicates that the hydrogel plaster preparation is stable during storage. Based on the homogeneity test results listed in Table 4, all hydrogel plaster formulations with various concentrations (4,6%, 5,6% and 6.6%) showed homogeneous and stable characteristics during the four-week observation period. There was no change in the consistency of the hydrogel plaster, indicating that it did not experience phase separation. This is also supported by the results of the centrifugation test, where no separation or sedimentation of particles was found after the centrifugal rotation, which confirms the stability and homogeneity of the preparation. The tested hydrogel plaster formulations have met the criteria for homogeneity and stability at all concentrations used. The hydrogel plaster preparation in all formulas shows a pH value according to the specifications in the range of 4.5-6.5 so it is safe to use and suitable for topical application.

Antibacterial test of hydrogel plasters containing extracts of kirinyuh leaves and palm empty fruit bunches using *S. aureus* bacteria. *S. aureus*, as a pathogenic bacteria, is a major cause of dangerous wound infections, delaying wound healing, and thus causing inflammation and chronic infection. Based on the results of the inhibition zone calculations observed in the media, the inhibition zone can be categorized as follows: 11 and 20 mm is categorized as strong, 6 to 10 mm is categorized as moderate, and less than 5 mm is categorized as weak antibacterial activity.

Based on the test results, wound length measurements showed that all treatment groups experienced changes in wound length from day 1 to day 14. However, group F0 experienced a significantly slower healing process compared to the other groups due to the absence hydrogel plaster of kirinyuh leaf extract and palm empty fruit bunches. Wound healing activity showed that F1 healed on day 12, F2 healed on day 10, F3 healed on day 8, the positive control healed on day 6, and the negative control healed on day 16, but scars remained until day 20. The results of this study indicate that kirinyuh leaf extract (*Chromolaena odorata L.*) and palm empty fruit bunches are effective as anti-inflammatory agents for incision wounds in male white rats (*Rattus norvegicus*).

CONCLUSION

Based on the research results, it can be concluded that hydrogel plasters from kirinyuh leaf extract and empty oil palm bunches are effective as anti-inflammatory agents for cuts in white rats (*Rattus norvegicus*). Hydrogel plasters made from kirinyuh leaf extract and palm empty fruit bunches offer a convenient and portable solution. The resulting combination of hydrogel plasters for cuts and wounds also contributes to environmental protection by utilizing the potential of empty oil palm bunch waste as a medicinal product.

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