

PHYSICAL EVALUATION OF RED GINGER EXTRACT (*ZINGIBER OFFICINALE* ROSC. VAR. RUBRUM) CREAM OF 10% AND 20% CONCENTRATION TO REDUCE LOW BACK PAIN FOR PREGNANT WOMEN IN SECOND AND THIRD OF TRIMESTERS

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ABSTRACT

Objective: The purpose of this study was evaluated the physical properties of the cream of red ginger extract (*Zingiber officinale* Rosc var. *Rubrum*), which is safe for pregnant women in helping pregnant women in the 2nd and 3rd trimesters to reduce low back pain.

Methods: The physical properties of red ginger extract (*Zingiber officinale* Rosc. var. *Rubrum*) cream was evaluated by using 2 activities, namely evaluation of creams consisting of organoleptic, pH, viscosity, spreadability and Homogeneity test, then continued with phytochemical screening, which consisted of an examination of alkaloids and examination of steroids.

Results: The evaluation results of making red ginger extract cream (*Zingiber officinale* Rosc. var. *Rubrum*) with a concentration of 10% and 20% meet *al. l* the requirements of the physical properties of the cream such as organoleptic test (smell, color, shape and texture are the same), pH test formula 1 (7.7980±0.13700), formula 2 (7.6060±0.9659), viscosity test formula 1 (22845.8440±12747.09092), formula 2 (39040.7480±206000.08235), dispersion test formula 1 (2.9400±0.25100-3.2200±0.41473), formula 2 (2.7600±0.23022-3.3100±0.17464) and homogeneity test on both formulas (homogeneous). Red ginger extract cream contains alkaloids from phytochemical screening results.

Conclusion: Red ginger extract cream (*Zingiber officinale* Rosc. var. *Rubrum*) with concentrations of 10% and 20% fulfills all the requirements for the physical properties of the cream and has the potential to be applied to pregnant women in the 2nd and 3rd trimesters who experience low back pain.

Keywords: Cream, Red Ginger, Pain

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INTRODUCTION

Ginger is a spice that can give a warm feeling to the body and spicy food. Red ginger rhizome contains flavonoids, phenols, terpenoids and essential oils (oleoresin). Oleoresin is a non-volatile or nonvolatile oil component that gives ginger a taste sensation [1]. Red ginger contains oleoresin (3%) and essential oil content of 2.58%-2.72%, which is higher than other types of ginger. The benefits of essential oils as antibacterial, while oleoresin consists of alpha-linolenic acid compounds that function as anti-bleeding, quercetin as an antioxidant, 6-ginger dion, 10-dehydrogingerdion, 8-paradol, 6-dehydropradol and capsaicin as an anti-inflammatory, 6-gingerol, 8-gingerol and 10-gingerol function as anti-inflammatory, analgesic and anti-bacterial, cholinergic acid and arsenal as cell generation stimulants, 6-shogaol, 8-shogaol and 10-shogaol as antioxidant, anti-bacterial, anti-inflammatory, angiogenesis and fibroblast proliferation [2].

The analgesic effect of ginger is related to the elements contained in ginger such as gingerol, shogaol, zingerone, diarylheptanoids, and their derivatives, especially paradol, which are known to inhibit cyclooxygenase, resulting in the formation or biosynthesis of prostaglandins that cause pain relief [3]. The anti-inflammatory effect of ginger is related to the active components in ginger such as gingerdione and gingerone, which can inhibit leukotrienes and prostaglandins, which are inflammatory mediators so that the body releases endorphins and enkephalins to inhibit pain transmission [4, 5]. The analgesic effect of red ginger proven by research on mice with 5%, 10% and 20% red ginger extract cream had analgesic effectiveness of 36.36%, 65.15% and 57.58% [6]. Research conducted on junior high school students, cream containing a mixture of red ginger oil and clove oil can reduce the intensity of primary menstrual pain [7]. Ginger oil applied to the lower back of maternity can reduce labor pain [8]. Ginger compresses are effective in relieving pain and reducing functional disability in patients with non-specific low back pain [9].

The red ginger extract in this study was formulated in the form of a cream because the preparations are easily evenly distributed on the

skin. The base cream used is a vanishing cream type because it provides a cooling effect on the skin, is not greasy and has good spreading ability [10]. The choice of this formulation is because pregnant women experience an increase in metabolism, which results in excessive sweating so that a formulation that can absorb directly into the skin is needed [11]. Meanwhile, the administration of boiled and dry red ginger extract given to mice was effective for 25 min and its effectiveness decreased at the 30th minute, and the use of dry red ginger extract was effective until the 30th minute [12]. Based on this, this study chose the formulation of vanishing cream of red ginger extract and evaluated the physical properties of the cream with the aim of knowing the physical properties of the preparation of red ginger extract cream as a safe anti-pain in pregnant women in the 2nd and 3rd trimesters to treat low back pain.

MATERIALS AND METHODS

Materials, chemicals and reagents

Red Ginger (*Zingiber officinale* Rosc. var. *rubrum*) was taken from Enggano Island, North Bengkulu Regency, Bengkulu Province, Indonesia. 96% alcohol, aqua dest, stearic acid, white wax, white vaseline, TEA, PEG, NaCl solution, Mayer's reagent, Dragendrof's reagent, Bouchardat's reagent, Acetic acid, H₂SO₄.

Instruments

Technical and analytical balance (Ohaus), pH meter ST3100 (Ohaus), water bath, glassware (pyrex), test tube, label adhesive, thermometer, parchment paper, rotary evaporator, viscometer, weight, ruler, evaporating dish, spatula.

Making extract

Fresh red ginger cleaned and then finely chopped, then dried for 4 d. After drying, it was mashed then macerated in 96% alcohol for 3 d to get a thick extract, concentrated with a rotary evaporator followed by evaporation with a water bath until thick.

Table 1: Formula 10% red ginger extract for 100 g preparations

Formula	Function	Amount (%)
Stearic acid	Oil phase base improves emulsion stability	32
White wax	Base phase of oil emollient	4
White Vaseline	Base phase of oil emollient	16
Triethanolamine	Water phase base improves emulsion stability	4
Propylene glycol	Water phase base improves emulsion stability	16
Red ginger extract	Active ingredients	10
Aquadest	Water phase base improves emulsion stability	18

Table 2: Formula 20% red ginger extract for 100-gram preparation

Formula	Function	Amount (%)
Stearic acid	Oil phase base improves emulsion stability	16
White wax	Base phase of oil emollient	2
White Vaseline	Base phase of oil emollient	8
Triethanolamine	Water phase base improves emulsion stability	2
Propylene glycol	Water phase base improves emulsion stability	8
red ginger extract	Active ingredients	20
Aquadest	Water phase base improves emulsion stability	8

Evaluation of the physical properties of the cream

Organoleptic test

Organoleptic tests were carried out by visual observation, which included odor, color, shape and texture of the preparation of red ginger extract cream with way; the cream dosage form uses the sense of sight, take 1 gram of cream, place it on a transparent glass and observe its form, namely liquid or thick, semi-solid or solid. The color of the cream preparation uses the sense of sight, take 1 gram of cream and place it on a transparent glass lined with white paper, then observe the color, which is very brown, brown, light brown or white. The smell of the cream preparation uses the sense of smell by taking 1 gram of cream and placing it on the back of the researcher's hand and then smelling the aroma, which is a distinctive odor, slightly smelly, odorless, or very odorless.

pH test

The pH testing was carried out to see the degree of acidity of the cream preparation. This test is carried out by comparing the acidity of the cream, formula 1 and formula 2. Measurement of pH is carried out with a pH meter, by means of calibration first using a buffer solution of pH 4, pH 7, pH 9, pH testing was carried out by dipping electrons into 5 ml of cream.

Viscosity test

The cream preparation was put into a cup, then installed *spindle* number 4 was and the rotor was run at a speed of 12 rpm. After the Brookfield viscometer showed a stable number, the results were recorded.

Spreadability test

A total of 0.5 grams of the formulated cream was weighed, then placed a petri dish on top and left for 1 minute, calculating the area given the preparation. Then given a load on each preparation of 50, 100 and 150 grams in a row, left for 60 seconds, then the area of the resulting preparation was calculated

Homogeneity test

1 gram of red ginger extract cream was taken on the top, middle and bottom and then smeared on the object-glass. Observed if there is a phase separation.

Phytochemical screening

Examination of alkaloids

The sample was weighed as much as 0.5 g, then added 1 ml of 2N hydrochloric acid and 9 ml of distilled water, heated in a water bath for 2 min, cooled and filtered. The filtrate obtained was used for the alkaloid test. The filtrate is divided into 3 tubes; each tube is added with 2 drops of Mayer's reagent to form a white precipitate, 2 drops

of Bouchardat's reagent will form light brown or yellow, and 2 drops of Dragendorff's reagent will form an orange precipitate if positive.

Steroid examination

The sample was mixed with acetic anhydride plus concentrated H₂SO₄ and acetic anhydride. A green-blue color change indicates the presence of steroids.

RESULTS AND DISCUSSION

Results the determinations

Determinations were made to ensure that the plant used for the study was *Zingiber officinale* Rosc. var *rubrum*. Determination was carried out by adjusting the morphological characteristics of the red ginger plant to the literature and testing was carried out at the Biology Laboratory Faculty of Math and Science, Bengkulu University with the number 43/UN30.12. LAB. BIOLOGI/PM2021.

The results of making extract

10 kg of fresh red ginger were cleaned and then finely chopped. Then dried for 4 d. After drying, the weight was 1,600 grams, then crushed to obtain a powder of 1,393 grams and then macerated in 96% alcohol for 3 d to obtain a thick extract. The 96% ethanol extract of red ginger using the maceration method had 6-gingerol content of 35.36 mg/g, 8-gingerol of 8.04 mg/g, 6-shogaol of 3.07 mg/g and 10-gingerol of 11.37 mg/g [13]. Red ginger extract was concentrated with a rotary evaporator followed by evaporation with a water bath until thick. The extract was obtained as much as 40.62 grams, the thick extract was made into cream preparations with a concentration of 10% and 20%. The cream preparation was carried out several tests to determine the physical properties of the cream in accordance with the requirements for the physical properties of the cream that had been determined.

Results of phytochemical screening

The results of phytochemical testing of red ginger extract are seen in table 3.

The sample is said to be positive for alkaloids if a positive reaction containing at least two reactions from the precipitation reaction group is carried out. The results of phytochemical tests that have been carried out contain alkaloids. Based on previous research, red ginger extract contains phytochemical compounds such as alkaloids, carbohydrates, proteins, resins, saponins, steroids, tannins, starch and glycosides, flavonoids and triterpenoids, saccharin albumin and phytosterols [14].

Results of evaluation of red ginger extract cream

Evaluation results of extract cream preparations red ginger in the form of organoleptic test, pH test, viscosity test, spreadability test and homogeneity are contained in table 4 below.

Table 3: Phytochemical screening results of red ginger extract

No	Phytochemical test	Reagent	Discoloration	Information
1	Alkaloids	Mayer	White precipitate	Alkaloid (+)
		Wagner	Chocolate precipitate	Alkaloid (+)
		Dragendrof	Yellow precipitate	Alkaloid (+)
2	Steroids	Lieberman-Buchardad	No Changes	Steroid (-)

Table 4: Evaluation results of red ginger extract cream

Parameters	Formula	
	F1	F2
Organoleptic	Yellowish chocolate, typical ginger, dan semi-solid	Yellowish chocolate, typical ginger, dan semi-solid
pH	7.7980±0.13700	7.6060±0.9659
Viscosity (cps)	22845.8440±12747.09092	39040.7480±20600.08235
Spreadability (cm) 50	2.9400±0.25100	2.7600±0.23022
	100	3.1600±0.37148
	150	3.2200±0.41473
Homogeneity	Homogeneous	Homogeneous

*Values are given as the mean±standard deviation (n=5).

In the second organoleptic test, the cream formula did not change in terms of color, smell or texture from the first week to the fifth week; this was because it was less likely to grow bacteria or fungi [15, 16]. The Smell and distinctive taste of ginger is caused by a mixture of essential oils such as shogaol and gingerol [17]. Research conducted by Febrianti and Sangande found a light brown color, a distinctive ginger odor, and a semi-solid texture [6, 16]. The distinctive smell of red ginger is one of aromatherapy that can provide a relaxing effect for tense nerves and muscles to reduce labor pain and for pregnant women who experience nausea and vomiting can reduce nausea and vomiting [8, 18].

The pH test aims to determine the safety of the cream preparation when used so that it does not irritate the skin. If the preparation has a low or acidic pH, it can irritate the skin, and vice versa if the pH of the preparation is too high, it will cause the skin to become dry. Topical preparations must meet these requirements; if the pH is too alkaline, it will cause the skin to become scaly, on the other hand, if the skin pH is too acidic, it can trigger skin irritation, the pH range of the skin in the body area is 4-7 [20, 21] The results of each pH test cream formula 1 is 7.7980±0.13700, formula 2 is 7.6060±0.9659. In Febrianti and Azkiya's research, it was found that the pH test was 6.01±0.01-6.08±0.02 [6, 19].

Viscosity test was carried out to determine the level of viscosity of the resulting preparation. Viscosity is a statement of a liquid to flow, the higher the viscosity the more difficult it is to flow/the greater the resistance [22]. The viscosity required by SNI 16-4399-1996 is 2,000 cp-50,000 cp. Based on the data, it is known that both preparations meet the requirements for viscosity values in formula 1 of 22845.8440±12747.09092, formula 2 of 39040.7480±20600.08235.

Testing the spreadability of the cream was carried out to determine the extent of the spread of the cream or the ease with which the cream was applied to the skin, thus allowing the active substance to be absorbed even greater. The test results obtained in formulas 1 and 2 using a load of 50 g, 100 g and 150 g obtained results in formula 1 of 2.9400±0.25100-3.2200±0.41473, formula 2 of 2.7600±0.23022-3.3100±0.174643. The resulting surface area is directly proportional to the increase in load.

The homogeneity test aims to see and know the mixture of ingredients for cream preparations. In this evaluation, the homogeneity test of the cream was carried out visually by observing the color of the cream and the presence or absence of parts that were not well mixed. The results showed that the cream preparations met the homogeneity requirement; that is, no coarse particles were seen. The requirement for the preparation of the cream is that if it is applied to a piece of glass, there is no separation between the components that make up the emulsion, if a cream has good texture homogeneity, the active substance will be spread evenly when applied to the skin.

CONCLUSION

Based on the results, it can be concluded that the red ginger extract cream (*Zingiber officinale rosc, var, rubrum*) with a concentration of 10% and 20% metal. I the requirements for the physical properties of the cream such as organoleptic, pH, viscosity, spreadability, and homogeneity. Red ginger extract cream contains alkaloids from the phytochemical screening results. This red ginger extract cream can be directly applied to pregnant women in the 2nd and 3rd trimesters who experience low back pain.

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AUTHORS CONTRIBUTIONS

The research team contributed fully to this research.

CONFLICT OF INTERESTS

No conflict of interest

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