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Formulation of Film Soap Ethanol Extract Mesocarp of Red Watermelon (Citrullus lanatus) and Antioxidant Activity Test

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ABSTRACT

Film soap is soap in the form of a thin layer having a thickness of 100 - 500 µm made of foaming film and plasticizer. The advantages of paper soap preparations are convenient in use, hygienic, practical, and easy to carry anywhere. Mesocarp red watermelon is a part of watermelon that contains flavonoid compounds that have antioxidant activity. The purpose of this study was to formulate the film soap of red watermelon mesocarp extract and to determine its antioxidant activity. In this study, the formulation was carried out by making four formulas with varying concentrations of ethanol extract mesocarp of red watermelon F0 = 0%; F1 = 1.5%; F2 = 2% and F3 = 3%. The evaluation was carried out in the form of organoleptic examination, pH, foam power, weight uniformity, moisture content, thickness, irritation test, stability and antioxidant activity tests. The evaluation results of the film soap from the four formulas were pH 9.29 - 9.12; weight uniformity 0.125 - 0.134 grams, water content 16.80 - 16.30%; thickness 0.14 - 0.15 mm and physically stable. The antioxidant activity of each formula was seen from the value, namely IC_{50}F0 = 76.42µg / mL; F1 = 70.36 µg / mL; F2 = 65.14µg / mL; F3 = 62.14 µg / mL. From the research results, it can be concluded that the ethanol extract of red watermelon mesocarp can be formulated into film soap and has antioxidant activity which is included in the strong group.

***KEYWORDS**: film soap, antioxidant activity, mesocarp red watermelon*

INTRODUCTION

Free radicals are chemical compounds that are reactive and unstable because they have one or more unpaired electrons that can cause damage to body molecules. Free radicals are a by-product of various complex chemical processes in the body's cells, such as exposure to sunlight and air pollution causing free radicals to increase. To overcome this, a supply of antioxidants from outside the body is needed. Some antioxidants are produced by plants such as vitamin C, vitamin E, -carotene, phenol groups, especially flavonoids (Muchtar *et al*, 2020).

Antioxidants are compounds that are able to counteract the negative effects of oxidants in the body, which work to give one electron to compounds that are okisdanso that the activity of oxidant compounds can be inhibited. Antioxidants are used to repair skin cells damaged by free radicals and ward off free radicals (Ulfa *et al*, 2019).

Watermelon (Citrullus lanatus) is a fruit that is much favored by the public because of its sweet taste and good for health. Watermelon is usually only consumed on the bright red part of the flesh while the white part is very less attractive to the public for consumption and only disposed of as underutilized waste. Mesocarps layer of

watermelon contains many substances that are useful for health, one of which is sitirulin. Sitirulin is an antioxidant that is beneficial for skin health. Based on the research on the antioxidant test of watermelon extract (Citrullus lanatus) on the mesocarp of red watermelon, mesocarp of yellow watermelon, flesh of red watermelon and flesh of yellow watermelon, the "IC50" values were 14,729; 16,782; 16,619 and 16,575 mg/L with very strong antioxidant activity category (Mariani et al, 2018).

Film Soap is a unique form of soap in the form of a thin layer. Film soap is a soap in the form of a thin sheet and has a thickness of 100-500 mm. Film soap has the advantage of being hygienic, practical to carry and not excessive in use, not easily brittle with a thin sheet shape (Mujahidah *et al*, 2013).

Based on the explanation above, the researchers were interested in formulating the film soap of ethanol extract mesocarp of red watermelon (*Citrullus lanatus*) with various extract concentrations of 1.5%, 2% and 3% as well as testing the antioxidant activity using the DPPH method.

MATERIAL AND METHODS

Chemicals and Instrument

Mesocarp of red watermelon from watermelon garden in Ulakan Tapakis, Padang Pariaman - West Sumatera, ethanol 70%, NaOH, Hydroprophyl Methyl Cellulosa (HPMC), glycerin, dinatrium EDTA, aqua dest, olive oil, sodium lauryl ether sulfate (SLES), nipagin, nipasol, vitamin C and DPPH powder. UV-Vis Spectrophotometer (PG T92+®), digital scales (Boeco®), rotary evaporator (Hettich zentrifugen®), moisture balance (Ohause®), micrometer screw, stirring rod, pH meter (Istek®), evaporating dish, oven (Memert®), furnace (Wise therm®).

Preparation of extract

400 g mesocarp of red watermelon dry powder by maceration using 70% ethanol for 3 days while stirring occasionally. After 3 days of immersion, it was filtered with filter paper to obtain the maserate, then the maserate was evaporated using a rotary evaporator, until a thick extract was obtained. Then the extract obtained was evaluated and a phytochemical screening test was carried out with the aim of seeing the quality or quality of the extract (Mujahidah *et al*, 2013).

Formulation *Film Soap* Mesocarp Of Red Watermelon Extract

Table 1. *Film soap* formula

Ingredients	%			
	F0	F1	F2	F3
Mesocarp red watermelon extract	0	1,5	2	3
NaOH	5	5	5	5
Olive oil	6	6	6	6
HPMC	3,5	3,5	3,5	3,5
SLES	7	7	7	7
Glycerin	5	5	5	5
Dinatrium EDTA	0,2	0,2	0,2	0,2
Nipagin	0,18	0,18	0,18	0,18
Nipasol	0,2	0,2	0,2	0,2
Fragrance Strawberry	5 gtt	5 gtt	5 gtt	5 gtt
Aquadest ad	100	100	100	100

The ingredients are weighed carefully. HPMC was developed in hot water (M1), sodium lauryl ether sulfate (SLES) and nipagin were dissolved in hot water (M2),

nipasol and disodium EDTA were dissolved in glycerin (M3). Olive oil and NaOH were mixed simultaneously at 70°C and stirred until a soap mass was formed. Then M1, M2, M3 was added and stirred. Lastly, added ethanol extract mesocarp of red watermelon until completely mixed. Then the formula is printed on a flat glass container which is then cut and stored in the container.

Evaluation *Film Soap* Mesocarp Of Red Watermelon Extract

Organoleptic

Examination of the shape, smell and color was carried out visually at room temperature for 6 weeks (Ministry of Health RI, 1980).

pH Test

The pH measurement was carried out with a pH meter. The pH measurement was carried out by weighing 1 gram of *film soap* dissolved with 10 ml of distilled water in a container. The electrode is dipped into the crucible and the number is allowed to move until it is in a constant position. The number shown by the pH meter is the pH of the *film soap* preparation (Ministry of Health, 2014).

Water content

Determination of water content is done using the Moisture Balance tool. The *film soap* is weighed 2 grams and put into a container that is already in the Moisture Balance tool. The operation of the tool has been completed when the alarm on the device sounds, then record the results of drying shrinkage (in percent) (Aktalis, 2018).

Film Soap thickness

The thickness of the *film soap* was checked with a micrometer which then measured the thickness of each *film soap* preparation. Then add up and find the average thickness (Harmely et al, 2015).

Foam Power

Put 1 sheet of *film soap* in a glass beaker, add 10 mL of distilled water. Stir with a magnetic stirrer at 600 rpm for 2 minutes. The height of the foam formed is measured and observed every week for 6 weeks (Poucher, 1993).

Stability

Stability checks were carried out using the *Freeze-Thaw* Method, storage in the freeze thaw cycle was carried out to see the physical stability after being stored at different temperatures, namely 4^{o}C and 40^{o}C. The film soap preparations were weighed as much as 2 g each and then put into a vial and then tightly closed and stored at an extreme temperature of 4˚C for 24 hours then stored at 40˚C for 24 hours, that is namely one cycle. The test was carried out for 6 cycles (Anggai *et al*, 2013).

Weight Uniformity

The uniformity of the film soap weight is done by weighing the film soap for each formula. Then the average weight of the film soap preparation was calculated (Anantia *et al*, 2019).

Determination of Antioxidant Activity by DPPH Method

Determination of the maximum absorption wavelength of DPPH

Take 4 ml of the newly prepared 35 g/ml DPPH solution, put it in a vial and add 2 ml of a mixture of ethanol and aquadest (1:1), then let it sit for 30 minutes in a dark place. Measure the absorbance of the solution with

a UV-Vis spectrometer with a maximum absorption wavelength is 400-800 nm.

Determination of antioxidant activity of vitamin C

From the solution of vitamin C (100 g/ml) 1 mL of each pipette was put into a 10 ml volumetric flask, add ethanol up to the mark so that the concentration (2; 4; 6; 8; 10) g/ml was obtained. Pipette 2 ml of each solution and put it into the vial, add 4 ml of 35 g/ml DPPH solution. Leave it for 30 minutes in a dark place. The absorption of the solution was measured using a UV-Vis spectrophotometer at a maximum wavelength of 400-800 nm.

Determination of antioxidant activity of film soap red watermelon peel extract

From the standard solution with a concentration of 1000 g/mL, 1 ml was pipetted, put in a 10 ml volumetric flask to obtain a concentration of 100 ppm. So that obtained a series of formulas with a concentration of 40;50;60;70;80 g/ml. Pipette each concentration of 2 mL of the sample solution into the vial, then add 4 mL of 35 g/mL DPPH. The mixture was homogenized and left for 30 minutes in a dark place. Measure the absorption using a UV-Vis Spectrophotometer at a maximum wavelength of 400-800 nm.

Calculation of Percentage Inhibiton and IC_{50} Value Determination

The absorbance of the sample was obtained by reducing the absorbance value of the sample with DPPH and the absorbance of the sample without DPPH. The percentage of inhibiton of the DPPH radical from the sample solution can be calculated by the formula :

$$\% \text{ Inhibition} = \frac{control\ absorbance - sample\ absorbance}{control\ absorbance} x\ 100\%$$

The "IC_{50}" value is calculated using a linear regression equation. IC_{50} is a number that indicates the concentration of the sample capable of inhibiting the activity of a radical by 50%. To determine the "IC_{50}" value, a standard curve equation of the percent inhibition is needed as the y-axis and the concentration of antioxidant extract as the x-axis.

$$y = a + bx$$

So that in the end the inhibitory concentration value was obtained 50% (y = 50; x = IC_{50}).

RESULTS AND DISCUSSION

Mesocarp of red watermelon extract is formulated in the form of film soap which is a thin sheet of soap, hygienic and easy to use by using only one sheet of film soap and rubbing it on the skin surface.In this soap film, an active substance is used, namely mesocarps red watermelon extract with a variant concentration (1.5%; 2%; 3%), which the choice of concentration based on the "IC_{50}" value of the ethanol extract mesocarp of red watermelon.

Table 2. Overall result evaluation of film soap

Evaluasi	Pengamatan

	F0	F1	F2	F3
Organoleptis				
-Bentuk	Film layer	Film layer	Film layer	Film layer
-Bau	Strawberry essence	Strawberry essence	Strawberry essence	Strawberry essence
-Warna	white	Yellowish white	Pale yellow	Pale yellow
pH	9,29 ± 0,23	9,28 ±0,24	9,20 ± 0,28	9,12 ± 0,23
Kadar Air	16,80%	16,25%	16,50%	16,30%
Ketebalan (mm)	0,14 ± 0,09	0,15 ± 0,08	0,15 ± 0,15	0,15 ± 0,08
Uji Stabilitas	TB	TB	TB	TB
Daya Busa (cm)	0,54 ±0,63	0,56 ±0,42	0,59 ± 0,51	0,58 ± 0,66
Keseragaman Bobot (gram)	0,125 ± 0,028	0,156 ±0,029	0,104 ± 0,001	0,134 ±0,095
Uji Antioksidan - IC_{50} value (µg/mL)	76,52	70,36	65,14	62,68

Organoleptic examination of the film soap mesocarps of red watermelon extract was carried out for 6 weeks, the aim was to see the physical appearance of a preparation (shape, smell, color). The resulting F0 film soap preparation was in the form of a thin sheet, white color because it did not contain extract in it, had a distinctive fragrance. due to the addition of fragrance. Meanwhile, F1, F2 and F3 are produced in the form of thin sheets, pale yellow in color and have a distinctive fragrance. From the results of organoleptic observations including shape, odor and color for 6 weeks there was no change, this indicated that the film soapwas physically stable during storage.

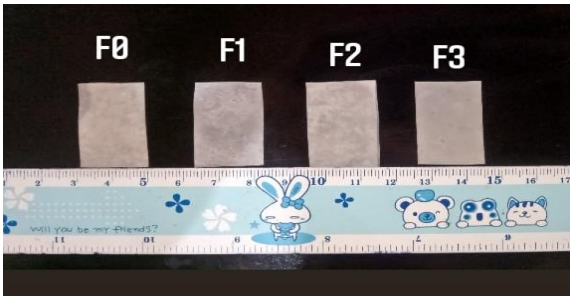

Figure 1. Film soap mesocarp red watermelon (*Citrullus lanatus*) ethanol extract

The pH examination of the film soap was carried out to determine whether the formulated film soap was safe to use on the skin. The pH value obtained is F0 = 9.23; F1= 9.28; F2 = 9.20 and F3 = 9.12. The standardization of the pH of film soap is not yet known, when compared with the pH in the research of Mujahida *et al*., 2013 which was obtained (10.07) and the pH of the formulated film soap is still within the standard. A pH value that is too high will cause the skin to become dry and irritated.

The foam power check is carried out with the aim of seeing how much foam is produced from the soap film. The results of the foam height obtained from each formula are F0 = 0.54 cm; F1 = 0.56 cm; F2 = 0.59 cm and F3 = 0.58 cm. Soaps that produce excess foam can cause skin irritation due to the use of too much foaming agent. In the film soap formula, foam is produced from the addition of sodium lauryl ether sulfate which acts as an anionic surfactant which is able to produce foam on film soap. The

requirements for the height of the soap foam are 0.13 – 2.2 cm (SNI, 1996).

Examination of the stability of the film soap preparation was carried out to observe organoleptic changes (color and shape) during storage time. Examination of the stability of the film soap at room temperature or in the freeze and thaw cycle showed that the film soap ethanol extract mesocarp of red watermelon did not undergo organoleptic changes for 6 cycles.

The weight uniformity check is carried out to determine the weight of the soap film, the standardization of the weight uniformity of the film soaps not yet known. The results of the uniformity of film soap weight obtained from the four formulas, namely F0 = 0.125 grams; F1 = 0.156 grams; F2 = 0.104 grams and F3 = 0.134 grams. Based on research by Habibah 2017 shows the results of uniformity in weight of film soap weighing 0.183 grams and 0.415 grams in the research conducted (Mujahidah *et al*, 2013). The results of different weight uniformity are due to differences in the printing of the soap film. Film soap is made in solid form which is then cut, the results affect the weight due to the non-uniformity in the cutting of film soap preparations (Habibah, 2017).

The film soap thickness was checked using a micrometer screw, the thickness was measured at five different places with three repetitions on the soap film. The results of the examination of the thickness of the film soap obtained from the four formulas are F0 = 0.14 mm; F1= 0.15 mm; F2 = 0.15 mm and F3 = 0.15 mm. The thickness of the film soap is influenced by the surface area of the mold used and the volume of the solution. The film soap was printed on a flat glass container, the four formulas met the characteristics of the film soap thickness, namely 10-500 mm. The results of the measuring water content were carried out using the Moisture Balance tool. Measurement of water content is intended to determine the water content of the formula from film soap. Based on the results obtained, the water content obtained from each film soap formula is F0 = 16.80%, F1 = 16.25%, F2 = 16.50% and F3 = 16.30%. The water content allowed in solid soap is not more than 15% (SNI, 1996).

In film soap, the standardization of water content still follows the standard of water content in solid soap because there is no standardization of water content for film soap. The water content produced by the film soap formula must be above 15%, because if the water content is low, the film soap is difficult to dissolve in water which will take a long time to use, stiff and difficult to use.

Antioxidant activity test was carried out using UV-Vis spectrophotometry using the DPPH method. The principle of DPPH is to measure the color change of DPPH which was previously purple and turns yellow if there are antioxidants (Mariani *et al*, 2018).

Determination of the maximum wavelength of 35 ppm DPPH resulted in a maximum absorption wavelength of 517 nm with an absorbance of 0.525. Determination of antioxidant activity was also carried out on vitamin C as a comparison. The results of the antioxidant activity test on vitamin C obtained an "IC_{50}" value of 7.2 g/mL which was categorized into a very strong antioxidant group.

Testing of antioxidant activity was carried out on all film soap formulas with "IC_{50}" value F0 = 76.52 g/mL; F1= 70.36 g/mL; F2= 65.14 g/mL; F3= 62.68 g/mL. In the results of the antioxidant activity test, the four samples of film soap ethanol extract of the mesocarp red watermelon, were categorized into strong antioxidant activity.

CONCLUSION

From the results of the research that has been done, it can be concluded that the ethanol extract of the mesocarp red watermelon (*Citrullus lanatus*) can be formulated in the form of film soap. The antioxidant activity test of the film soap formula it was found that the categorized into strong antioxidant group.

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