Variations In Concentration Of Tween 80 And Span 80 Emulgator In Body Scrub Extract Formulation Watermelon (*Citrullus lanatus*) Water On Physical And Chemical Stability

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Abstract. Watermelon is a tropical fruit that is rich in sucrose, glucose and fructose which can function to moisturize the skin. Watermelon contains lycopene which can function as an antioxidant to protect the skin from the effects of free radicals. *Body scrub* Functions to smooth and whiten body skin. Span 80 and Tween 80 are an-ionic emulsifiers that can be used in making body scrubs.This study aims to determineVariation in concentration of tween 80 and span 80 emulsifiers in watermelon (Citrullus lanatus) water extract body scrub formulation with physical stability test. Type of experimental research with design*post test with control with group design*.This research process useswatermelon water extract thickened with a water bath thermostat at 80°C. The concentration of watermelon extract used was with an HLB value of 9 (F1) on a cream basis, 8 (F2), 9 (F3) and 10 (F4). The preparation evaluation included physical tests and data analysis using Kruskal Willis and Mann Whitney.Determination of conformity is obtainedwatermelon plant. Physical standards showed a deep red color (typical of watermelon), pH 5, phytochemical screening (sucrose +, flavonoids +, saponins +).Test the stability of concentration variationsEmulgator Tween 80 and Span 80 in the watermelon (Citrullus lanatus) water extract body scrub formulation found that in cycle 0 there was a difference in spreadability (p 0.041), cycle 1 there was a difference in spreadability (p 0.041), cycle 2 there was a difference (p 0.000) , cycle 3 there is a difference in spread power (p 0.015), cycle 4 there is a difference in spread power (p 0.000), cycle 5 there is a difference in spread power (p 0.014), cycle 6 there is a difference in spread power (p 0.014). VariationThe concentration of tween 80 and span 80 emulsifiers had an effect on the physical test of the watermelon (Citrullus lanatus) water extract body scrub formulation in the form of organoleptic, homogeneity, pH and spreadability tests.

Key words: [Body Scrub, Water Extract, Watermelon.]

INTRODUCTION

One of the skin problems that often occurs is premature aging which is usually caused by free radicals. Free radicals are a factor that can induce degenerative diseases because they can oxidize nucleic acids, proteins, fats and even cell DNA. The oxidation of this molecule can be inhibited by compounds called antioxidants(Nature, 2014). The human body does not have large amounts of antioxidant reserves, so if excessive radical exposure occurs, the body needs exogenous antioxidants. The side effects of using synthetic antioxidants make natural antioxidants a much needed alternative(Tranggono, 2012). Antioxidants play an active role in overcoming excess free radicals by working as free radical scavengers and preventing chain reactions from occurring(Andarina, 2017). Antioxidants work by donating one electron to a compound that is an oxidant so that the activity of the oxidant compound can be inhibited.(Winarsi, 2014).

Antioxidants can be synthetic antioxidants or natural antioxidants. Natural antioxidants come from plants, fruit, vegetables and spices. Chemical compounds belonging to the antioxidant group are found in plants from the polyphenol, vitamin C, vitamin E, carotene and flavonoid groups.(Dewi and Mustika, 2014). One of the natural antioxidant ingredients that has benefits for skin care is watermelon (Citrullus lanatus).(BPOM, 2014). Watermelon contains 91.45% water, 0.15% fat, 7.55% carbohydrates, 0.4% fiber, 6.2% sugar, vitamins such as vitamin C, thiamine, riboflavin and niacin(United States Department of Agriculture, 2016). Watermelon contains carotenoids including lycopene, phytofluene, phytoene, beta-carotene and lutein. The active ingredients of watermelon which act as moisturizers are sugar-type carbohydrates, namely sucrose, glucose and fructose which are the main sugars found in watermelon.(Liu et al., 2013).

The active ingredients in watermelon such as sucrose are included in the humectant group, which has a moisturizing effect because it has hydroxy groups which cause water to bind from the air or

environment so that it can reduce the evaporation of water in the skin so that the skin's moisture is maintained.(Lubis and Reveny, 2014). One of the uses of natural ingredients as cosmetics is in the form of body scrub cream. Body scrub cream is a skin care cosmetic product that contains rather harsh ingredients or is usually called obrasive cosmetics(Nature, 2014). Cosmetics are ingredients or mixtures of ingredients used by humans to clean, maintain and increase attractiveness(Tranggono, 2012). Watermelon contains active ingredients that can be used for body care, in the form of cream, ointment or body scrub(Ekayanti et al., 2019).

The basic ingredients of scrub cream are the same as skin cleansing creams in general which contain refreshing fats. Scrub cream contains coarse granules which act as abrasives so that they can remove dead cells from the epidermis. Body scrub cream preparations contain several types of compositions and ingredients, one of which is an emulsifier (Tranggono, 2012). An emulsifier is a surface active agent (surfactant) that reduces the interfacial tension between oil and water and surrounds the dispersed droplets in a strong layer that prevents coalescence and separation of the dispersed phase.(Ansel, 2014). Cream preparations can be formed and stable if the right emulsifier is used. The choice of base is based on its intended use and the type of material to be used. The body scrub made is in the form of a cream with the O/A type using varying concentrations of emulsifier. This type of emulsion was chosen because it is easier to wash off with water and is not greasy. In addition, the level of irritation is low and is not influenced by pH.(Lachman, 2014). An-ionic emulsifiers have the advantage of penetrating the skin well because they can interact well with skin fats and proteins.(Levin and Miller, 2014).

Span 80 and Tween 80 are anionic emulsifiers that have a balance of lipophilic and hydrophilic properties, are non-toxic, non-irritating, have low potential to cause hypersensitivity reactions, and are stable against weak acids and weak bases.(Rusmin, 2020). Previous research studied more about the antioxidant activity of watermelon and research studied the effectiveness of watermelon extract in a moisturizing cream preparation by considering the sugar content in watermelon. However, there is no evaluation regarding the variations in concentration of tween 80 and span 80 emulsifiers in watermelon extract body scrub formulations.(Ekayanti et al., 2019). Variations in emulsifiers have an influence on body scrub preparations, as research results show that by evaluating variations in tween-span emulsifier concentration, namely 1%, 2% and 3%, it was found that the most stable black tea extract body scrub cream was formula 2 with a tween-span concentration of 2%. .

Based on this description, the author is interested in knowing the variations in the concentration of tween 80 and span 80 emulsifiers in the watermelon (Citrullus lanatus) water extract body scrub formulation with physical stability tests which include organoleptic tests, homogeneity, emulsion type, pH, viscosity and stability.

METHODS

Type of experimental research with design*post test with control with group design*. Samples areWatermelon purchased at the Mayong Jepara Market Shop. This research process useswater extract, namely fresh fruit juice thickened with a water bath thermostat at 80°C. The concentration of watermelon extract used was with an HLB value of 9 (F1) on a cream basis, 8 (F2), 9 (F3) and 10 (F4). The preparation evaluation included physical tests and data analysis using Kruskal Willis and Mann Whitney

RESULTS AND DISCUSSION

1. Determination of watermelon fruit

   Determination was carried out by matching the morphology of the watermelon fruit with the determination key in the literature, which was carried outinBiology Laboratory, Ahmad Dahlan University, Yogyakarta.The results of the determination of the red watermelon plants used in this research are as follows:

   1b – 2b – 3b – 4b – 12b – 13b – 14b – 17b – 18b – 19b – 20b – 21b – 22b – 23b – 24b – 25b – 26b – 27a – 28b – 29b – 30b – 31a – 32a – 33c – 631a – 632a – 633a – 634b – 635b – 636b – 637b – 638a – 639b – 640b – 652d – 653a – 654b Cucurbitaceae (Familia)

   1b – 2b – 4b – 6b – 7b – 9b – 11b – 12a – 13a – 14a – 15b – 16a – 17b – 19b Citrullus (Genus)

   1 Citrullus lanatus (Thunb.) Matsum. & Nakai. (Species)

Determination of the plant is Class Magnoliopsida (two pieces / dicots), Nation: Cucurbitales, Tribe: Cucurbitaceae, Genus: Citrullus, Type: Citrullus lanatus. Based on the determination results, it shows that the watermelon used in this research is in accordance with the literature.

2. Sample Preparation and Extract Making

1 kg of watermelon, fruit that is still fresh and wet and free from contaminants. Fresh red watermelon fruit is washed clean, the red flesh is separated from the skin and seeds. The fruit flesh is then cut into smaller pieces and weighed to get the weight. The next step, fresh simplicia is mashed with a blender, then filtered. The watermelon juice is then evaporated using a water bath at 80℃ until a thick extract is obtained. In line with researchDewi et al. (2014)AndEkayanti et al. (2019)heating temperature800C is a stable temperature for getting a thick extract of watermelon water without damaging the contents of the watermelon. The thick extract of watermelon water that is obtained is weighed to determine its weight and this thick extract of watermelon water will be used in making a body scrub. The results of calculating the thick extract can be seen in table 4.1

Table 4.1 ResultsMakingExtract

Fruit Weight	Fruit flesh weight	Fruit juice weight	Thick extract weight
3300 g	1849 g	1719 g	192

Source: Processed primary data (2022)

3. Extract Standardization

a. Non-specific standardization (Water content)

Determination of water content aims to measure the water content contained in simplicia and provide a minimum limit on the amount of water content in the material. Determination of water content is carried out using a moisture balance tool. The moisture balance tool is turned on and the numbers are zeroed. A total of 2 grams of red watermelon water extract was spread over an aluminum cup. The moisture balance tool is closed and waited until the sign that appears on the moisture balance tool is read and the water content is recorded. The results of determining the water content ofRed watermelon water extract can be seen in table 4.2.

Table 4.2 Data on Water Content Results of Red Watermelon Water Extract

	Water content (%)	Condition (%)	Information
Replication 1	11.87%	5-30%	Fulfil
Replication 2	11.79%	5-30%	Fulfil
Replication 3	11.67%	5-30%	Fulfil
Average±elementary school	11.78%±0.001	5-30%	Fulfil

Source: Processed primary data (2022)

Note: SD = Standard deviation

The table results show that the average water content used in this study was 11.78%. These results indicate that the water content of simplicia has met the requirements, namely < 30%. Water content below 30% can prevent hydrolysis reactions, insect disturbance and microbial growth in simplicia. This is as explained by previous research that the water content for making body scrubs must be less than 30% because it supports the stability level of the extract and improves the emulsion of the preparation so that it does not degrade easily (Pangestu, 2015).

b. Specific standardization

1) Organoleptic

The organoleptic test is a test carried out to observe the water extract of red watermelon in terms of color, smell and texture. The organoleptic test is carried out using the five human senses, namely the sense of taste to determine the taste, the sense of smell to determine the smell and the sense of sight to determine the color of the preparation, namely a deep red color, the distinctive smell of watermelon and a thick (liquid) texture. The results of the organoleptic examination of watermelon water extract are as follows:

Table 4.3 Data on Organoleptic Results of Red Watermelon Water Extract

Color	Smell	Texture
Deep red	Typical watermelon	Thick

Source: Processed primary data (2022)

Based on table 4.3, research results from the specific standardization of watermelon water extract in organoleptic examination which aims to determine the color, smell and texture of watermelon water extract. Watermelon water extract is dark red in color, has a distinctive watermelon smell and has a thick texture.

2) pH level

Determination of pH using a Universal pH tool. The sample was made in a concentration of 1%, namely weighing 1 g of red watermelon water extract dissolved in 100 ml of distilled water. The universal pH is dipped in the solution. Leave it until the pH changes color, then look at the color that appears and align it with the available pH dye guide. The pH test results of watermelon water extract are seen in table 4.4:

Table 4.4 Data from pH examination results of red watermelon water extract

Extract pH		Condition	Information
Replication 1	5	4.5-7	Fulfil
Replication 2	5	4.5-7	Fulfil
Replication 3	5	4.5-7	Fulfil

Source: Processed primary data (2022)

Based on table 4.4, the pH test results get a value of 5 which shows that it meets the criteria (4.5-7). The results of the pH examination on the watermelon water extract were 5 from the results of replication 3 times, the pH result of 5 is considered a weak acid.The physiological requirements for skin pH are 4.5-7, which the results of this research meet the pH requirements. pH testing is done to see. Human skin has a pH range of 4.5-6.5. The pH value should not be too acidic because it can irritate the skin and should not be too alkaline because it will make the skin scaly (Tranggono, 2012).

4. Phytochemical Screening

The phytochemical screening test is one way to find out the chemical compounds contained in a plant or simplicia. Phytochemical analysisWatermelon water extract (*Citrullus lanatus*) carried out were tests for flavonoids, sucrose, tannins, saponins. Flavonoid test using methanol and sulfuric acid. Anhydrous acetic acid and concentrated sulfuric acid are required for triterpenoid and steroid testing. Test sucrose qualitatively using the molish test. Molisch's reagent consists of a solution of α-naphthol in ethanol. The test was carried out by placing 2 mL of the sample solution in a test tube then adding 2 drops of Molisch reagent and adding 5 mL of concentrated sulfuric acid through the wall. A positive result was indicated by the formation of a purple color in the solution. The tannin test uses a 1% FeCl3 solution while the saponin test uses shaking to see the formation of foam. Phytochemical screening results of red watermelon water extractcan be seen in table 4.5 below;

Table 4.5 Data from Phytochemical Screening Results of Red Watermelon Water Extract

Phytochemical Screening	Test results	Information	Sterms
Sucrose Test	(+)	Contains sucrose	Purple in color
Flavonoid Test	(+)	Contains flavonoids	Coloured Red
Saponin Test	(+)	Contains saponin	There is foam
Tannin Test	(-)	Does not contain tannin	Dark blue or blackish green in color

Source: Processed primary data (2022)

Information:

1. (+) = Positive
2. (-) = Negative

The results of the phytochemical screening of watermelon water extract contained sucrose, flavonoids and saponins but did not contain tannins. In accordance with research by Oseni and Okeye (2013), watermelon water extract contains sucrose, flavonoids, saponins and no tannins

5. Body Scrub Formulation

The process of making a watermelon extract body scrub preparation begins with preparing tools and materials. The materials used in this research include watermelon water extract as an active ingredient which has antioxidant properties and rice flour as a sanding agent which can remove dead skin cells. All ingredients used are weighed. The oil phase is made by melting a mixture of adeps lanae which functions as a base, stearic acid functions as an emulsifier, cetyl alcohol functions as an emollient, span 80 emulsifier and propyl paraben functions as a preservative, melted at a temperature of 70 ℃. The water phase is made by dissolving methyl paraben which functions as a preservative in heated distilled water and adding propylene glycol which functions as a wetting agent, glycerin which functions as a humectant and Tween 80 which functions as an emulsifier, melted at a temperature of 70 ℃.These two phases are melted at 70 ℃. Because the temperature of 70 ℃ is the highest melting point for melting materials in the oil phase. The water phase is heated to the same temperature, namely 70 ℃ because if the water phase is not the same temperature as the oil phase, then some materials will become solid, resulting in separation between the oil phase and the water phase. The oil phase and water phase are mixed into a hot mortar and then crushed to form a creamy mass. The thick extract of watermelon juice and sifted rice flour are slowly added to the cream base that has been formed, then stirred until homogeneous.

Previous research by Hariyah (2022) found that making body scrubs at too high a temperature caused the emulsion in the body scrub to become unstable. This will result in chemical and physical changes, the chemical changes that can occur are changes in color and aroma, while the physical changes are phase separation. The stability of the emulsion in body scrubs is influenced by several factors, namely mechanical factors, temperature and instability during the mixing process. Wenas (2021) states that the temperature set for body scrubs is 70℃, because it supports the formulation of body scrub cream.

The results of the formulation of the watermelon (Citrullus lanatus) water extract body scrub preparation withconcentration variationsdifferent tween 80 and span 80 emulgators.

Table 4.6 Data on HLB Value of Red Watermelon Water Extract

Formula	Tween 80	Span 80	HLB value
F1	4.39	5.66	9
F2	3.45	6.55	8
F3	4.39	5.66	9
F4	5.32	4.68	10

Source: Processed primary data (2022)

Information :

1. F1 = Body scrub base contains tween 80 and span 80 hlb 9
2. F2 = Body scrub containing tween 80 and span 80 hlb 8
3. F3 = Body scrub containing tween 80 and span 80 hlb 9
4. F4 = Body scrub containing tween 80 and span 80 hlb 10

The results of the formulation of the watermelon (Citrullus lanatus) water extract body scrub preparation withconcentration variationsemulgator tween 80 and span 80 which consists of hlb values 8, 9, 10 and base. The body scrub preparation that has been made is then evaluated for physical properties to check the quality of the body scrub made. Evaluation was carried out on preparations with different storage temperatures, namely 4 °C and 40 °C. This aims to ensure that the properties and characteristics are the same as those possessed during the manufacturing process and the physical instability of the preparation is indicated by changes in odor and color. Physical properties testing was carried out with 6 observations, namely in cycles 1 to cycle 6 with the parameters tested being organoleptic, pH, homogeneity, cream type and spreadability (Ekayanti, 2019).

Winarti (2016) states that variations in HLB values with various surfactant-cosurfactant and oil ratios are used to obtain high stability values. HLB between 8-10 meets a stable vulnerability in making body scrubs. The higher the HLB value, the hydrophilic nature of the surfactant, so it is more soluble in water, so that the oil phase will be evenly dispersed into the water phase and form an emulsion (Alawiyah, 2020).

6. Physical evaluation
   a. Organoleptic

Organoleptic testing is a physical parameter to visually see changes in shape, color and smell. The organoleptic requirements for body scrub preparations are the presence of coarse granules, the color of the preparation is homogeneous and the smell is fragrant (Milgia, 2020). Organoleptic testing aims to determine the organoleptic stability of the body scrub preparation that has been made. Organoleptic testing is a physical parameter to visually see changes in shape, color and smell. The organoleptic requirements for body scrub preparations are the presence of coarse granules, the color of the preparation is homogeneous and the smell is fragrant (Milgia, 2020).

Test resultsorganolepticBody scrub preparations from watermelon water extract can be seen in table 4.7 below

Table 4.7 Data on Organoleptic Test Results for Body Scrub Preparations from Watermelon Water Extract

Formulation	Color	Smell	Texture
F1	White	Typical base	Semi solid
F2	Dark orange	Typical watermelon	Semi solid
F3	Dark orange	Typical watermelon	Semi solid
F4	Dark orange	Typical watermelon	Semi solid

Source: processed primary data (2022)

Based on the data table of organoleptic test results, the body scrub preparation produced in F1 has a semi-solid texture, has a distinctive base smell and is white in color and uses hlb 9 because the hlb 9 value is in the middle of the hlb value. Meanwhile, F2, F3 and F4 have a semi-solid texture, have a distinctive smell of watermelon water extract and are dark orange in color. F1 is colorless because it is a base where there are no added extracts in the formula.

The results of organoleptic tests in cycles 0-6 of body scrub preparations from watermelon water extract can be seen in table 4.9 below

Table 4.9 Data on Organoleptic Test Results for Body Scrub Preparations from Watermelon Water Extract

Formula	Cycle	Color	Smell	Texture
F1	0 - 6	White	Typical base	Semi solid
F2	0 - 6	Dark orange	Typical watermelon	Semi solid
F3	0 - 6	Dark orange	Typical watermelon	Semi solid
F4	0 - 6	Dark orange	Typical watermelon	Semi solid

Source: processed primary data (2022)

The results of stability tests on all body scrub preparation formulas for 6 cycles (for 12 days) at temperatures of 4 ℃ and 40 ℃ showed that there was no change in texture, odor and color. In accordance with research by Milgia (2020), storage does not affect the dosage form of body scrub, this is because storage is protected in a closed container and protected from light.

   b. Homogeneity

ObservationHomogeneity can be achieved by smearing the preparation on a piece of glass or other transparent material, then spreading it evenly, if there are no grains then the preparation can be said to be homogeneous (BPOM, 2014). The aim of the homogeneity test is to see and determine whether the cream preparation ingredients are mixed and homogeneous preparations will give good results because the ingredients are evenly dispersed in the base ingredients, so that each part of the preparation contains the same amount of ingredients. If the ingredients are not evenly dispersed in the base material, the preparation will not provide the desired effect (Ulaen, 2013). The homogeneity test results for body scrub preparations from watermelon water extract can be seen in table 4.8 below

Table 4.8 Data on Homogeneity Test Results for Body Scrub Preparations from Watermelon Water Extract

Formula	Homogeneity
F1	Homogeneous
F2	Homogeneous
F3	Homogeneous
F4	Homogeneous

Source: Processed primary data (2022)

Based on the results of the homogeneity test on F1, the results showed that the preparation was homogeneous and coarse grains were visible on the glass. In F2, F3, F4 it is homogeneous with coarse grains due to the addition of rice flour which acts as a scrubbing agent. In body scrub preparations there are coarse granules because if the preparation is smooth and slippery it is not able to remove dead skin cells on the surface of the skin, so ingredients are needed that can remove them from the skin or what is commonly called scrub cream (Kristianingsih & Munawaroh, 2021). In the body scrub formulation that acts as scrubbing is rice flour.The results of the 0-6 cycle homogeneity test for body scrub preparations from watermelon water extract can be seen in table 4.10 below

Table 4.10 Data on Homogeneity Test Results for Body Scrub Preparations from Watermelon Water Extract

Cycle	F1	F2	F3	F4	Fulfills / No
0	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Fulfil
1	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Fulfil
2	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Fulfil
3	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Fulfil
4	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Fulfil
5	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Fulfil
6	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Fulfil

Source: Processed primary data (2022)

Based on the results of the homogeneity test in cycles 0-6 there was no change, in F1 the results showed that the preparation was homogeneous and coarse grains were visible on the glass. In F2, F3, F4 it is homogeneous with coarse grains due to the addition of rice flour which acts as a scrubbing agent. In body scrub preparations there are coarse granules because if the preparation is smooth and slippery it is not able to remove dead skin cells on the surface of the skin, so ingredients are needed that can remove them from the skin or what is commonly called scrub cream (Kristianingsih & Munawaroh, 2021). In the body scrub formulation that acts as scrubbing is rice flour.

c. pH level

The pH test aims to determine the safety of the cream preparation when used so that it does not irritate the skin. pH testing is carried out by attaching pH paper to the preparation and then matching the color change of the pH paper with a pH meter (BPOM, 2014).The results of the pH test for body scrub preparations from watermelon water extract can be seen in table 4.11.

Table 4.11 Data on Organoleptic Test Results for Body Scrub Preparations from Watermelon Water Extract

Cycle	F1	F2	F3	F4	Parameter	Fulfills/ No
0	5	5	5	5	4.5-7	Fulfil
1	5	5	5	5	4.5-7	Fulfil
2	5	5	5	5	4.5-7	Fulfil
3	5	5	5	5	4.5-7	Fulfil
4	5	5	5	5	4.5-7	Fulfil
5	5	5	5	5	4.5-7	Fulfil
6	5	5	5	5	4.5-7	Fulfil

Source: Processed primary data (2022)

The results of the research found that the pH levels in F1, F2, F3 and F4 met the standard with a level of 5. This is in line with research by Khoirunnisa (2016) which stated thatThe pH for cream preparations is 5-8, so the preparation meets the pH requirements for body scrub cream. The scrub was stored for 6 cycles (cycles 1, 2, 3, 4, 5 and 6), showing that the pH of the preparation was still at a pH that was safe for use on skin, so it did not irritate the skin or could be used on human skin. The physiological requirements for skin pH are 4.5-7, which the results of this research meet the pH requirements. pH testing is carried out to see the safety of body scrub cream on the skin. Human skin has a pH range of 4.5-6.5. The pH value of the preparation should not be too acidic because it can irritate the skin and should not be too alkaline because it will make the skin scaly (Tranggono, 2012).

7. Cream type

Cream typing is carried out to ensure the cream remains stable and does not experience inversion during the stability test. Emulsion type testing was carried out after the end of 6 stability test cycles using the cycling test method. The expected type of emulsion is O/W, because the HLB value of the preparation made is 8.9 and 10. O/W type cream is formed if the HLB value is 8–18. Meanwhile, A/O type emulsions are formed when the HLB value is 4–6. The test type of cream chosen was the staining method using methylene blue because it is easy and provides visually clear results. Methylene blue is a dye that is hydrophilic (easily soluble). Positive results are indicated by uniform blue on the body scrub cream (Husni et al, 2019).Test resultstypeBody scrub cream made from watermelon water extract can be seen in table 4.13.

Table 4.13 Test Result Data Type of Cream for Body Scrub Preparation from Watermelon Water Extract

Formula	Replication 1	Replication 2	Replication 3
F1	M/A	M/A	M/A
F2	M/A	M/A	M/A
F3	M/A	M/A	M/A
F4	M/A	M/A	M/A

Source: Processed primary data (2022)

The cream type results show that the watermelon water extract body scrub is a cream with the O/W oil-in-water type. In line with research by Khoirunnisa (2016) it is stated that determining the type of emulsion preparation can be done using methyl blue, if the methyl blue dissolves when stirred then the emulsion is in the form of the O/W type. Testing the body scrub using methylene blue gave an even color. The oil phase coloring is still well dispersed in the water phase (O/W). Which means there is no change in the tween 80 and span 80 emulgator films due to the influence of temperature. Inversion can occur due to the influence of temperature, at low temperatures the emulsion is more hydrophilic, while at high temperatures it is lipophilic (Eccleston, 2007).

8. Spreadability test

The spreadability test is carried out to determine the base's ability to spread on the skin surface when applied. The criteria for a good cream is that it has good viscosity so it is easy to spread and is not too runny. The data in this study showed that the spreadability of the formula met the criteria, namely 5-7.The results of the spreadability test of body scrub preparations from watermelon water extract can be seen in table 4.12.

Table 4.12 Data on Spreadability Test Results of Body Scrub Preparations from Watermelon Water Extract

Formula	Spread Power	Condition	Information
F1	5.1	5-7	Fulfil
F2	5.7	5-7	Fulfil
F3	5.5	5-7	Fulfil
F4	5.2	5-7	Fulfil

Source: Processed primary data (2022)

ResultsWhichobtained for F1, F2, F3 and F4 in 6 cycles (days 1, 2, 3, 4, 5 and 6) where all formulas met the requirements for semi-solid dosage forms because the spreadability test results were

within the range of spreading capacity of semi-solid dosage forms. good, namely 5-7 cm. In F1, the result is the lowest spreadability because there is no extract and the hlb value is 9. For preparations that use watermelon water extract, F2 has the highest spreadability because the hlb value in F2 is 8 and F4 is the lowest because the hlb value in the F4 body scrub preparation is 10. In accordance with research by Pangestu et al. (2015) that the addition of Span 80 and Tween 80 at higher concentrations will increase the stability of the cream. This is in accordance with research that has been conducted that the higher the hlb value, the thicker the body scrub preparation and the smaller the spreadability value.

The spreadability test is carried out to determine the base's ability to spread on the skin surface when applied. The criteria for a good cream is that it has good viscosity so it is easy to spread and is not too runny. The data in this study showed that the spreadability of the formula met the criteria, namely 5-7. Previous research shows that spreadability is influenced by temperature, light and humidity factors and the longer the storage time can affect the spreadability of the preparation (Sahlia, 2019).The results of the watermelon water extract body scrub spreadability test from cycles 0-6 can be seen in table 4.13.

Table 4.13 Data on Spreadability Test Results for Body Scrub Preparations from Watermelon Water Extract

	Cycle						
Formula	**0**	**1**	**2**	**3**	**4**	**5**	**6**
F1	5	5.1	5	5.1	5	5	5
F2	5.7	5.7	5.7	5.7	5.7	5.7	5,6
F3	5,6	5.5	5.4	5.4	5.5	5.5	5.4
F4	5.2	5.3	5.3	5.2	5.3	5.3	5.3

Source: Processed Primary Data (2022)

Results Whichobtained for F1, F2, F3 and F4 in 6 cycles (for 12 days) where all formulas met the requirements for semi-solid dosage forms because the spreadability test results were within the range of good semi-solid dosage spreading capacity, namely 5-7 cm. In F1 with the lowest spreadability results due to the absence of extract. For preparations using watermelon water extract, F2 has the highest spreadability and F4 with the lowest. In accordance with research by Pangestu et al. (2015) that the addition of Span 80 and Tween 80 at higher concentrations will increase the stability of the cream. This is in accordance with research that has been conducted that the higher the hlb value, the thicker the body scrub preparation and the smaller the spreadability value.

The statistical test results showed that the body scrub preparations from cycle 0 to cycle 6 in F1, F2, F3 and F4 in the data normality test were not normal and the homogeneity test showed that they were homogeneous.

Table 4.14 Data Normality Test from Spreadability Test

Formula	P value	Description P value
F1	0,000	Abnormal data
F2	0,000	Abnormal data
F3	0,000	Abnormal data
F4	0,000	Abnormal data

Source: processed primary data (2022)

Information:

1. P value <0.05 = normal data
2. P value >0.05 = data is not normal

In the normality test, the spread power test in cycle 0 shows that the data is not normal,showingthe data is not normal because P Value > 0.005. Next, a data homogeneity test was carried out from the spreadability test of the body scrub preparation from watermelon water extract, showing homogeneous data, which can be seen in table 4.15.

Table 4.15 Data Homogeneity Test from Spreadability Test

Cycle	P value	Description P value
0-6	>0.05	Homogeneous data

Source: Processed primary data (2022)

Information:

1. P value <0.05 = data is not homogeneous
2. P value >0.05 = homogeneous data

Because the data was not normal and homogeneous, the non-parametric Kruskal-Wallis test was continuedshowP value <0.05 which means there is significant data between F1, F2, F3, and F4.

Table 4.16 Test*Kruskal-Wallis of the Spreadability Test*

P value	Description P value
<0.05	Significant

Source: Processed primary data (2022)

Information:

1. P value <0.05 = there is a difference betweenF1, F2, F3, and F4
2. P value >0.05 = no difference betweenF1, F2, F3, and F4

Then proceed with the Mann-Whitney test to determine the differences between body scrub preparation formulas.ResultsMann-Whitney test of the stock spreadability test*body scrub*from extract table 4.17.

Table 4.17 Mann-Whitney Test of Spreadability Test

Formula	P value	Description P value
F1-F2	<0.05	Significant
F1-F3	<0.05	Significant
F1-F4	<0.05	Significant
F2-F3	<0.05	Significant
F2-F4	<0.05	Significant
F3-F4	<0.05	Significant

Source: Processed primary data (2022)

Information:

1. P value <0.05 = there is a significant difference
2. P value >0.05 = no significant difference
3. F1 = Body scrub base contains tween 80 and span 80 hlb 9
4. F2 = Body scrub containing tween 80 and span 80 hlb 8
5. F3 = Body scrub containing tween 80 and span 80 hlb 9
6. F4 = Body scrub containing tween 80 and span 80 hlb 10

Comparisons of F1 and F2, F1 and F3, F1 and F4, F2 and F3, F2 and F4, F3 and F4 all have a P value <0.05, which means there is a significant difference in each formula.This significant difference is because F1 is a base without the addition of watermelon water extract, while F2, F3 and F4 with the addition of watermelon water extract and different variations in tween and span concentrations so that the \hlb values are different. Sin accordance with research by Pangestu et al. (2015) that the addition of Span 80 and Tween 80 at higher concentrations will increase the stability of the cream. This is in accordance with research that has been conducted that the higher the hlb value, the thicker the body scrub preparation and the smaller the spreadability value.

CONCLUSION

ExtraWatermelon (Citrullus lanatus) water can be formulated into body scrub preparations in the form ofoil-in-water type O/W. VariationThe concentration of tween 80 and span 80 emulsifiers had an effect on the physical test of the watermelon (Citrullus lanatus) water extract body scrub formulation in the form of organoleptic, homogeneity, pH and spreadability tests. Results of concentration variation stability testsEmulgator Tween 80 and Span 80 in the watermelon (Citrullus lanatus) water extract body scrub formulation found that in cycle 0 there was a difference in spreadability (p 0.041), cycle 1 there was a difference in spreadability (p 0.041), cycle 2 there was a difference (p 0.000), cycle 3 there is a difference in spread power (p 0.015), cycle 4 there is a difference in spread power (p 0.000), cycle 5 there is a difference in spread power (p 0.014), cycle 6 there is a difference in spread power (p 0.014).

SUGGESTION

It is necessary to carry out an irritation test to determine the irritation index caused and an antioxidant test to determine the antioxidant activity contained in the extract from the watermelon water extract body scrub preparation with the tween 80 and span 80 emulsifiers

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