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Formulation of Moisturizer Cream Containing Orange Melon (*Cucumis melo* L. var. reticulatus) Fruit Extract

(Formulasi Sediaan Pelembab Ekstrak Buah Melon *Orange* (*Cucumis Melo* L. var. reticulatus) Dalam Bentuk Krim)

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Abstract: Environmental factors such as extreme sunlight may disrupt skin's moisture balance and cause the skin to dry out. Therefore, skincare products such as moisturisers are highly needed. In this study, orange melon (*Cucumis melo* L. var. reticulatus) was added to increase the value of the moisturizer product. Orange melon contains sucrose as the moisturising substance and antioxidant substance which helps to normalize the skin. The extraction process was carried out using juicer. The fruit extract was used at 10% (FI), 20% (FII), and 30% (FIII). This study aims to know the impact of increasing orange melon extract concentration on the physical characteristics of cream and its moisturising effect and antioxidant activity as well as the best formula. The evaluations consisted of physical characteristics, moisturising effect, and antioxidant test with DPPH method. The statistical results showed that the increase in extract concentration significantly affect the physical characteristics (pH, viscosity, spreadibility, ease of removal, adhesivity) and moisturising effect of the creams. Increasing extract concentration would cause a significant increase in the moisturising effect of creams containing synthetic humectant. The best formula which fulfilled the requirements of physical characteristics and effectiveness test, while possessing antioxidant effect was F2 (20% orange melon extract).

Keywords: Antioxidant, cream, *Cucumis melo*, dry skin, moisturizer, reticulatus

Abstrak: Faktor eksternal lingkungan seperti paparan sinar matahari yang ekstrim dapat menganggu keseimbangan kulit dan menyebabkan kulit menjadi kering. Oleh itu, dibutuhkan suatu produk perawatan kulit seperti pelembab. Pada penelitian ini, sediaan topikal pelembab ini dikombinasikan dengan bahan alam yakni buah melon *orange* (*Cucumis melo* L. var. reticulatus) untuk menambah nilai guna dari sediaan. Buah melon *orange* mengandung senyawa humektan sukrosa sekaligus senyawa antioksidan yang mampu menormalkan kondisi kulit kering. Metode ekstraksi terpilih adalah metode perasan. Konsentrasi ekstrak yang digunakan adalah 10% (F1), 20% (F2) dan 30% (F3). Penelitian ini bertujuan untuk mengetahui pengaruh peningkatan konsentrasi ekstrak melon *orange* terhadap mutu fisik, efektivitas daya melembabkan, daya antioksidan serta mengetahui formula sediaan krim pelembab terbaik. Evaluasi sediaan meliputi mutu fisik, efektivitas daya pelembab, dan aktivitas antioksidan sediaan. Aktivitas antioksidan diuji menggunakan metode DPPH. Hasil analisa statisitik menunjukkan bahwa peningkatan konsentrasi ekstrak melon *orange* berpengaruh signifikan terhadap mutu fisik : pH, viskositas, daya sebar, daya tercucikan air, daya lekat dan efektivitas daya pelembab. Peningkatan konsentrasi ekstrak menyebabkan peningkatan signifikan pada efektivitas daya pelembab sediaan yang mengandung senyawa pelembab sintetis. Formula terbaik yang memenuhi spesifikasi uji mutu fisik dan efektivitas serta memiliki nilai tambah khasiat antioksidan adalah F2 (konsentrasi ekstrak 20%).

Kata kunci: Antioksidan, *Cucumis melo*, krim, kulit kering, pelembab, reticulatus

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INTRODUCTION

EXTERNAL factors such as extreme sun exposure can disrupt the skin's balance and cause the skin to become dry[1]. The use of moisturizing cosmetic preparations can overcome dry skin conditions. One natural ingredient that has moisturizing potential and is safe to use is orange melon (*Cucumis melo* L. var. reticulatus). Orange melon contains the sugar compound sucrose, which has many hydroxyl groups so that it is easy to form hydrogen bonds with water and maintain skin moisture[2,3]. Orange melon fruit also contains various antioxidant compounds, such as -carotene, vitamin C, and secondary metabolites from the terpenoid and other flavonoid groups, which are efficacious in counteracting free radicals' formation normalizing skin conditions[4]. In a previous study, orange melon fruit extract tested at a concentration of 2 - 10% was proven to have antioxidant activity of up to 55% by the DPPH method[5]. Unfortunately, the orange melon fruit extract was only tested for its antioxidant activity; no other research has been found regarding the utilization of orange melon flesh, which leads to the formulation of skincare preparations, especially in moisturizing creams. Based on these considerations, a study was conducted on orange melon fruit extract (*Cucumis melo* L. var. reticulatus) as the main active ingredient in the formulation of a vanishing cream-based moisturizing cream which has the property of softening the skin as well as value-added antioxidant properties. This study aims to determine the effect of the concentration of orange melon extract (*Cucumis melo* L. var. reticulatus) (10%, 20%, and 30%) on physical quality: pH, viscosity, spreadability, adhesion, water washability and effectiveness of moisturizing power, knowing the effect of adding melon orange extract on the efficacy of moisturizing preparations containing synthetic moisturizing ingredients (glycerin and propylene glycol), and knowing the best formulation formula that meets physical quality specifications and effectiveness and has antioxidant properties. Evaluation of moisturizing cream preparations included physical quality tests: organoleptic, pH, viscosity, homogeneity, spreadability, adhesion, water washability, emulsion type, effectiveness of moisturizing power, antioxidant activity, and stability. The evaluation results were analyzed statistically with SPSS statistical software 23.0. The test results between parametric formulas for pH, viscosity, spreadability, water washability, adhesion, the effectiveness of moisturizing power, and antioxidant activity were statistically analyzed using the oneway ANOVA method ($\alpha = 0.05$); if the data were significantly different, followed by the Post Hoc Tukey HSD test. The test results between batches of parametric data were analyzed using the Independent sample t-test method. The test results between non-parametric formulas were analyzed statistically using the Kruskal-Wallis method[6]

Based on the description above, the purpose of this study was to determine the effect of increasing the concentration of orange melon extract (*Cucumis melo* L. var. reticulatus) (10%, 20%, and 30%) on physical quality: pH, viscosity, dispersibility, water washability, adhesion, and effectiveness: moisturizing power of preparations and antioxidant capacity.

MATERIALS AND METHODS

MATERIALS. The main ingredients are orange melon (*Cucumis melo* L. var. reticulatus) obtained from Hokky Fruit Shop Surabaya, East Java. Additives: The additives used in this study have pharmaceutical-grade specifications, namely stearic acid (PT. Sumi Asih, Indonesia), glycerin (PT. Ecogreen Oleochemicals, Singapore), triethanolamine (Petronas Chemicals, Malaysia), propylene glycol (Dow Chemical Co., Indonesia), methylparaben (Clariant, Deutschland), propylparaben (Clariant, Deutschland), aquadest (Loba Chemie PVT, LTD), methanol pa (Mailinckrodt Baker Inc, Philipsburg), DPPH (Sigma - Aldrich, Singapore), chloroform (Mailinckrodt Baker Inc, Philipsburg), and hydrochloric acid (Mailinckrodt Baker Inc, Philipsburg).

Tools. The tools used in this study were analytical balance (Sartorius type Al-500, Germany), pH meter (Methrom 620, Switzerland), Brookfield viscometer (Synchro-Letic LVT, USA), Multiscan GO Microplate Reader (Thermo scientific, Finland), juicer (Cosmos, Indonesia), thermostatic water bath (Memmert, Germany), and oven (Memmert, Germany).

METHODS. Standardization of Fresh Simplicia Orange Melon *(Cucumis melo* L. var. reticulatus). The standardization of fresh simplicia was carried out macroscopically, including observing the fruit's shape, color, and weight. Orange melon fruit has a round-oval fruit shape, a rough and green skin surface with a perfect net groove, and weighs 1 - 2 kg[7].

Preparation of Extract of Orange Melon Fruit *(Cucumis melo* L. var. reticulatus*).* The orange melon was cut, the fruit's mesocarp was separated from the skin, and then the juice was extracted using a juicer. The juice was concentrated with a thermostatic water bath at 50-60 ◦C to obtain a thick extract form. The extract was weighed, and the yield of the extract was calculated for fresh fruit. The extract was then standardized for non-specific and specific parameters[8].

Non-Specific and Specific Standardization of Orange Melon (*Cucumis melo* L. var. reticulatus) The thick extract of melon orange was standardized with non-specific and specific parameters. Non-specific parameter standardization includes determination of water content, total ash content, acid-insoluble ash content, and water-soluble ash content. Standardization of specific parameters includes organoleptic observation, pH value determination, water-soluble extract content, ethanol-soluble extract content, and sucrose active substance profile by Molisch test on extracts[8].

Determination of Sucrose Profile by Molisch Test. A total of 10 g of extract/preparation was dissolved in 10 mL of distilled water to obtain a concentration of 10%. Added the sample solution with two drops of Molisch reagent and 2 mL of concentrated sulfuric acid through the test tube wall. Gave the same to the pure sucrose solution as a comparison[9].

Antioxidant Activity Test of Extracts. Extract dissolved in methanol p.a. and added 197.6 ppm DPPH solution with a ratio of 1:1. Then it was left for 45 minutes in a dark room, and the absorbance was measured at a wavelength of 517 nm[5].

Preparation of Moisturizing Cream Formulation of Orange Melon Extract (*Cucumis melo* L. var. reticulatus). The design formula for the moisturizing cream preparation can be seen in Table 1. The stearic acid was melted in a water bath at 70–80 ºC. Triethanolamine, methylparaben, and propylparaben were dissolved into propylene glycol (Mixture 1). Mix 1 is added to glycerin (mixture 2), stir until thoroughly mixed, and then heated with stearic acid in a cup on a water bath (Mixture 3). The remaining water is also heated until it boils. The mixture of 3 and the remaining water is put into a hot mortar and then stirred at a constant speed to form a creamy mass. Added the orange melon extract according to the concentration used in the cream base mixture, then crushed until the cream mass was well mixed and solidified.

Table 1. Standard formula and modified formula for moisturizing preparation of melon orange fruit extract.

Composition	Function	Usual Concentration (%)	Standard formula (%)	Modified Formula					
				F1	F2	F3	B1	B2	B3
Melon *orange extract*	Active ingredient	-	-	10	20	30	-	-	30
Stearic Acid	Emulsifying agent	1-20	15	15	15	15	15	15	15
Glycerin	Humectan	5-30	8	5	5	5	5	-	-
Propylen Glycon	Humectan	3-15	3-15	3	3	3	3	-	-
Potassium Hydroxide	Alkalizing agent, Emulsifier		0.70	0.9	0.9	0.9	0.9	0.9	0.9
Triethanolamine	Alkalizing agent, Emulsifier	0.002-0.9		0.9	0.9	0.9	0.9	0.9	0.9
Methylparaben	Preservatives	0.02 – 0.3		0.18	0.18	0.18	0.18	0.18	0.18
Propylparaben	Preservatives	0.01 – 0.6		0.02	0.02	0.02	0.02	0.02	0.02
Aquadest ad	Solvent	Aquadest ad	ad	100	100	100	100	100	100

Evaluation of Moisturizing Cream Preparations Orange Melon Extract (*Cucumis melo* L. var. reticulatus). Organoleptic Test. The organoleptic test is intended to see the physical appearance of the cream, including the shape, color, and smell of the cream. The test specifications can be seen in Table 6.

pH test. The pH test method refers to Rawlins (2003) [10], modified. The test was started by calibrating the pH meter (Methrom 620, Switzerland) with standard buffer solutions of pH 4, pH 7, and pH 10. The cream was put in a glass beaker to a certain height until immersed the electrode. The recorded

pH value is constant. The test specifications can be seen in Table 6.

Homogeneity Test. The homogeneity test method, which has undergone modifications. A total of 0.5 g of the cream on a slide is applied to a piece of glass or other suitable transparent material. The cream must show a homogeneous arrangement, and no coarse grains can be seen. The test criteria can be seen in Table 2. The test specifications can be seen in Table 6[11].

Table 2. Assessment criteria for homogeneity examination of moisturizing cream of melon orange fruit.

Criteria	Description
Not homogeneous	The preparation separates, and there are coarse grains or fulfills one of the criteria (separate only or there are only coarse grains)
Homogeneous	The preparation does not separate, and there are no coarse grains.

Viscosity Test. The method of testing the viscosity of the preparation, which has been modified. This test was carried out using a Brookfield viscometer (Synchro-Letic LVT, USA). Put 250 mL of the cream into a glass beaker to a certain extent. Spindle no. 6 is mounted on the tool, and the tool speed is set at 10 rpm and 12 rpm[12,13]. The test specifications can be seen in Table 6.

Spreadability Test. The method of testing the spreadability of the cream, which has been modified. A total of 0.5 g of the cream was placed between 2 glasses measuring 20 x 20 cm lined with graph paper, then given a load of 100 g and left for 1 minute. The diameter of the dispersion of the cream, which states the dispersion ability of the cream, is recorded. The test criteria can be seen in Table 3. The test specifications can be seen in Table 6 [14].

Table 3. Assessment criteria for the spreadability test of moisturizing cream of melon orange fruit extract.

Criteria	Diameter
Hard to spread	< 3 cm
Easy to spread	3 - 5 cm
Very easy to spread	> 5 cm

Water Washability Test. The method of testing the water leachability of the preparation, which has been modified. A total of 1 g of the cream was spread on the palm to have an area of 5 cm x 5 cm, then washed with a specific volume of water. Water is passed from the burette at a rate of 1.0 mL/s, and the volume of water used for washing preparations is recorded on the palms of the hands. The test criteria can be seen in Table 4. The test specifications can be seen in Table 6 [12].

Adhesion Test. The method of testing the stickiness of the cream, which has been modified. 0.3 g of the cream was placed between 2 slides of the same size and given a load of 1 kg for 5 minutes. The object glass placed on the test instrument gave a load of 100 g, and the time release of the sample was recorded. The test criteria can be seen in Table 5. The test specifications can be seen in Table 6 [14].

Table 4. Criteria for the assessment of the water washability of the moisturizing cream of melon orange fruit extract.

Criteria	Water volume (ml)
Difficult to wash off with water	≥ 20 ml
Easy to wash off with water	10 - 20 ml
Very easy to wash off with water	≤ 10 ml

Table 5 . Assessment criteria for stickiness test moisturizing cream melon orange fruit extract.

Criteria	Time (minute)
Not sticky	< 1 menit
Sticky	1 - 2 menit
Very sticky	> 2 menit

Emulsion Type Test. The test method for emulsion cream is 0.5 g of the cream was added with one drop of methyl blue and then stirred with a stirring rod. Cream with an oil in water (O/W) emulsion type are expected to have a methyl blue coloration that is evenly distributed. The test specifications can be seen in Table 6 [15]

Moisturizing Power Effectiveness Test. The method of testing the effectiveness of moisturizing power, which has undergone modifications. The series of test equipment consists of 1 plastic pot with holes and one plastic pot without holes attached in the prone position. A total of 10 g of activated blue silica gel was wrapped in gauze and placed on the roof of a perforated plastic pot. The series of tools were attached to the panelist's arm, smeared with the preparation with the help of non-woven medical adhesive and transparent tape and, left for 3 hours, then weighed again. As a test blank, a series of tools were installed on another arm area that was not smeared with the cream and given the same treatment. Before and after the test, the weight gain silica gel calculates the % reduction in water evaporation from the skin [16]. The test specifications can be seen in Table 6.

Antioxidant Activity Test of Orange Melon Moisturising Preparations using the DPPH method with a Spectrophotometer Micro-plate Reader. The test solution was weighed 10 grams of moisturising cream of melon orange extract from each formula (F1, F2, and F3) and dissolved in 10 mL of a mixture of pro analysis methanol and water (methanol pa: water = 1:1), then homogenized. Using a vortex filter, the

Table 6. Specifications of moisturizing cream of melon orange extract.

Specification	Description
Physical Quality Test	
Colour	Orange to brownish orange
Smell	Typical melon orange
Shape	Cream
pH	6.00 ± 0.50 (Singh *et al*., 2011)
Viscosity (cPs)	60.000 ± 1.000 cPs (Buhse *et al*., 2005)
Homogeneity	Homogen (SNI, 1996)
Spreadablity (cm)	Easy to spread (diameter: 3.5 ± 0.5 cm) (Garg *et al*., 2002)
Adhesion (second)	Not sticky (< 1 menit) (Betageri dan Prabhu, 2002)
Water washability (ml)	Easy to wash off with water (volume: 15.0 ± 2.5 ml) (Arndt and Hsu, 2007)
Emulsion type	O/W (Panda, 2000)
Effectiveness Test: Sorption Desorption Test (SDT)	Reduction of preparation water evaporation > 30% (Draelos, 2000)
Antioxidant Activity Test (% DPPH scavenging activity)	The antioxidant power of the preparation was not significantly different from the antioxidant power of the extract.
Physical Stability Test	Stable during storage (no organoleptic changes (color, odor, and homogeneity), pH value, and viscosity)

clear part of the solution was separate. The control solution consists of 100 l of DPPH solution mixed with one methanol pa (100 l). The sample solution consists of 100 l of the test solution mixed into 100 l of DPPH solution (concentration 197.6 ppm) at a ratio of 1:1. The blank sample solution consisted of 100 l of the test solution and 100 l of methanol pro analysis. The control solution, sample solution, and blank solution were pipetted into a 96-well plate well and replicated three times, then incubated in a dark room at room temperature for 45 minutes and observed the absorbance of the solution at the selected maximum wavelength.

The absorbance of the control solution, the blank solution, and the test solution were then used to determine the value of %DPPH scavenging activity or %inhibition[5]. Based on data obtained, the correlation between the increased extract concentration and the increase in the value of %DPPH scavenging effect was determined with the parameter in the form of the calculated r-value at = 0.05 df = 1.

Qualitative Test of Efficacious Active Substance (Sucrose) on Moisturizing Cream Preparations Orange Melon Fruit Condensed Extract. Qualitative testing of sucrose content was carried out using the Molisch test. Each cream and pure sucrose were weighed as much as 1 g, then dissolved with distilled water up to 10 mL to obtain a sample solution and a positive blank with a concentration of 10%. The negative blank solution consisted of distilled water. The Molisch test begins by adding 2 mL of the sample solution to a test tube, then adding two drops of Molisch reagent and 2 mL of concentrated sulfuric acid dropwise through the walls of the test tube. They then gave the same treatment to the positive and negative blank solutions. Positive test results are indicated by the appearance of a dark purple color in the solution[9].

Stability Test. The method of physical stability test, which have been modified. This accelerated stability test is carried out by storing the preparation at a temperature (27±2 °C) for four weeks. Observations were made, including organoleptic observations: color, odor, homogeneity, pH value, and viscosity of the preparation [13]. The test specifications can be seen in Table 6.

Statistical Data Analysis. The evaluation data were processed using SPSS 23.0 software. The parametric data included the pH test results, viscosity, dispersibility, water leaching, adhesion, the effectiveness of moisturizing power, and antioxidant activity. Statistical analysis of parametric data between formulas was carried out using the One Way ANOVA method ($\alpha = 0.05$). If the value of F count > F table, then the results are declared to be significantly different and followed by the Post Hoc Tukey HSD test[6].

RESULTS AND DISCUSSION

Results of Standardization of Fresh Orange Melon Fruit Simplicia. The orange melon fruit was examined macroscopically, which included the fruit's shape, colour, and weight. The macroscopic observations of orange melon can be seen in Figure 1 and Table 7.

Results of Condensed Extract of Orange Melon Fruit (*Cucumis melo* L. var. reticulatus). In this study, 950 grams of fresh orange melon were peeled and cleaned of seeds. The orange melon is cut into smaller pieces, and the juice is extracted using a juicer. The fruit juice obtained was filtered using a flannel cloth and then concentrated on a thermostatic water bath with a temperature of 50-60 °C. Concentration

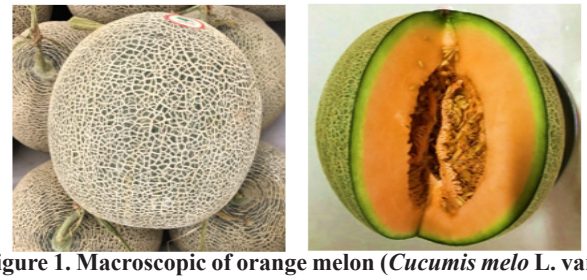

Figure 1. Macroscopic of orange melon (*Cucumis melo* L. var. reticulatus) (Private Collection).

Table 7. Macroscopic observations of orange melon (*Cucumis melo* L. var. reticulatus).

	Results	Literature[7]
Shape	Round – oval	Round – oval
Color	Fruit skin: Green, perfect mesh groove Flesh of fruit: Orange	Fruit skin: Green, perfect mesh groove Flesh of fruit: Orange
Weigh	1.90 – 1.95 kg	1 - 2 kg

resulted in a thick extract of as much as 54.3 grams with a yield of 5.72%, which is calculated for fresh fruit. The extraction results can be seen in Figure 2.

Results of Standardization of Condensed Extract of Orange Melon Fruit (*Cucumis melo* L. var. reticulatus). Standardization carried out on the thick extract of melon orange includes non specific parameters and specific parameters. The standardized results of the orange melon thick extract can be seen in Table 8.

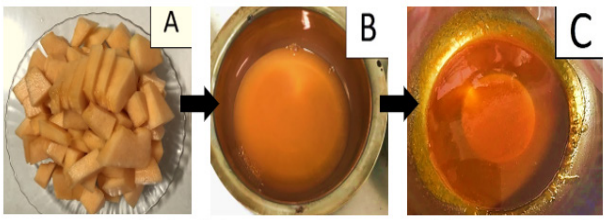

Figure 2. (A) Fresh Simplicia melon orange; (B) Orange melon juice;(C) Thick extract from orange melon juice.

Evaluation Result of Moisturizing Cream Preparation of Orange Melon Extract (*Cucumis melo* L. var. reticulatus). Physical quality evaluation includes organoleptic, pH, homogeneity, viscosity, dispersibility, water washability, adhesion, and emulsion type. The overall evaluation results of the physical quality can be seen in Table 10. Organoleptic observations, which included visual form, colour

Table 8. Standardization results of orange melon fruit (*Cucumis melo* l. var. reticulatus) condensed extract.

Parameter	Observation result
Non-specific standardization	
Water content (%)	10.77 ± 0.37
Total ash content (%)	296 ± 0.09
Acid insoluble ash content (%)	0.23 ± 0.04
Water soluble ash content (%)	2.45 ± 0.13
Specific standardization	
Organoleptic	
Shape	Thick
Colour	Chocolate - orange
Odour	Typical orange melon
Flavor	Sweet
pH	5.28 ± 0.01
Water soluble extract content (%)	60.98 ± 1.84
Ethanol soluble extract content (%)	26.11 ± 2.42
Molisch test profile for sucrose content	(+) / purple layer is formed

and odour of the preparation, met the desired specifications, namely in the form of cream, orange to brownish orange in colour and a characteristic melon smell. The organoleptic observations can be seen in Table 9 and Figure 3.

Based on the results, all formulas F1 – F3 have met the general requirements for cream preparations, but the formula that meets all specifications for physical quality aspects is F2. The increase in extract concentration significantly affected the evaluation of physical quality: pH, viscosity, spreadability, water washability, and adhesion, judging from the data F count > F table. The results of the organoleptic test of the preparation were in accordance with the desired specifications, namely the form of cream, brownish-orange colour, with a distinctive melon odour. The higher concentration of extract in the preparation, the stronger the intensity of the brown colour of the preparation (Figure 3). The decrease in pH

Table 9. The results of organoleptic observations of moisturizing cream preparations of orange melon fruit extract (*Cucumis melo* L. var. reticulatus).

Formula	Parameter Uji		
	Shape	Warna	Bau
Formula 1	Cream	*Orange*	Typically Melon
Formula 2	Cream	Brownish orange	Typically Melon
Formula 3	Cream	*Brownish orange*	Typically Melon
Blank 1	Cream	White	No smell
Blank 2	Cream	White	No smell
Blank 3	Cream	*Brownish orange*	Typically Melon

Blank 1 Blank 2 Blank 3 Formula 1 Formula 2 Formula 3

Figure 3. The results of organoleptic observations of moisturizing cream preparations of orange melon fruit extract (*Cucumis melo* L. var. reticulatus) in various formulas.

Table 10. Quality of moisturizing cream of orange melon fruit extract (*Cucumis melo* L. var. reticulatus).

Criteria	F1	F2	F3	B1	B2	B3	Specification
Physical quality							
1. Organoleptic							
a. Color	Orange	Brownish orange	Brownish orange	White	White	White	Brownish orange
b. Odor	Typically melon orange	Typically melon orange	Typically melon orange	-	-	Typically melon orange	Typically melon orange
c. Shape	Cream	Cream	Cream	Cream	Cream	Cream	Cream
2. pH	6.41± 0.01	6.32 ± 0.01	6.27 ± 0.02	6.94 ± 0.68	6.90 ± 0.01	6.20 ± 0.01	6.00 ± 0.50
3. Viscosity (cPs)	40363 ± 221	60182 ± 60	62238 ± 192	36345 ± 185	30337 ± 408	57190 ± 198	60000 ± 1000 cPs
4. Homogeneity	Homogenous	Homogenous	Homogenous	Homogenous	Homogenous	Homogenous	Homogenous
5. Spreadability (cm)	4.50 ± 0.06	3.33 ± 0.05	3.18 ± 0.08	5.87 ± 0.12	6.28 ± 0.12	3.43 ± 0.04	Easy to spread (spread diameter: 3.5 ± 0.5 cm)
6. Water washability (ml)	10.25 ± 0.36	17.12 ± 0,16	19.17 ± 0.16	6.25 ± 0.41	4.43 ± 0.28	12.43 ± 0.14	Easy to wash off with water (water volume: 15.0 ± 2.5 ml)
7. Adhesion (minute)	32.02 ± 0.97	39.12 ± 0.67	47.94 ± 0.57	11.05 ± 0.21	5.51 ± 0.28	35.53 ± 0.65	Not Sticky (< 1 minute)
8. Emulsion type	O/W	O/W	O/W	O/W	O/W	O/W	O/W

preparation, with an increase in the concentration of the extract, was caused by the pH of the melon extract being weakly acidic (5.28±0.01). In contrast, the pH value of the blank preparation tended to be alkaline, namely 6.94±0.07, so the greater the proportion of extract in the preparation, the higher the proportion of the extract in the preparation. The pH value of the preparation decreases. The viscosity value of the preparation increased along with the increase in extract concentration. The density of the dosage form has a directly proportional relationship with the viscosity of the preparation according to the formula V = k x d x t, where v is the viscosity and d is the specific gravity[17]. The greater the proportion of melon orange thick extract in the preparation, the specific gravity and viscosity of the preparation also increased. The viscosity parameter has an inverse relationship with the spreadability of the cream. The higher viscosity of preparation, the greater the resistance of the preparation to spread, causing the dispersion ability of the preparation to decrease[18]. Preparations with high viscosity also have a thicker consistency so that the time and stickiness also increase. The washability of water preparations is influenced by the physical and chemical properties of the productive substances in the extract. The higher the concentration of the extract in the preparation, the more sucrose content in the preparation also increases. The presence of acid content and the heating process of the extract caused the inversion process of some of the sucrose compounds into their constituent components, namely glucose and fructose. The increase in fructose content causes the extract to become more sticky so that when it is formulated, it affects the water washability of the preparation[19]. Based on the adhesion test results of preparation, it was concluded that the increase in the concentration of the extract affected the adhesion of the preparation.

Based on the physical quality evaluation results, it was found that F1, F2, and F3 had met the general requirements. F2 is a formula that has met all specifications for physical quality, including organoleptic, pH, homogeneity, viscosity, spreadability, water washability, adhesion, and emulsion type. The results showed that increasing the concentration of melon orange extract significantly affected aspects of the physical quality of the preparation : pH, viscosity, spreadability, water washability, and adhesion. Increasing the concentration of melon orange extract decreased the pH value but increased the viscosity

of the preparation. Increasing the viscosity of the preparation reduces the dispersibility and washability of the preparation and increases the adhesion time of the preparation.

Moisturizing Power Effectiveness Test Results. The results of testing the effectiveness of the moisturizing power of all formulas meet the specifications, namely having % moisturizing ability >30% (Table 11). The increase in extract concentration significantly affects the effectiveness of the preparation, judging from the data F count > F table. The difference in effective moisturizing effectivity between formulas was caused by the differences in concentration extract in the preparation. The results showed that the value of r arithmetic (0.9860) >r table (α = 0.05; 0.8114), which means that there is a significant relationship between the concentration of the extract and the effectiveness of the moisturizing power of the preparation (Figure 4). Higher concentration of extract in the preparation, the effectiveness of moisturizing effectivity also increases because the content of sucrose in the preparation also increases. Preparations F3 (highest concentration of melon orange extract 30%) successively have a value of % ability to moisturize the skin, greater than F2 and F1. Sucrose sugar compounds are hygroscopic and contain many hydroxy groups. They quickly form hydrogen bonds with water from the environment and cause a crystallization process that retains moisture on the skin surface, rehydrates, and keeps the skin moist[20-1].

Antioxidant Activity. The results of the antioxidant activity test showed that all formulas had met the desired dosage specifications, namely, having an antioxidant activity that was not significantly different from the extract (Table 12). Increasing the concentration of the extract had a significant effect on the value of the antioxidant activity of the preparation, judging from the data F count > F table. The difference in antioxidant activity values between formulas was caused by differences in the concentration of extracts

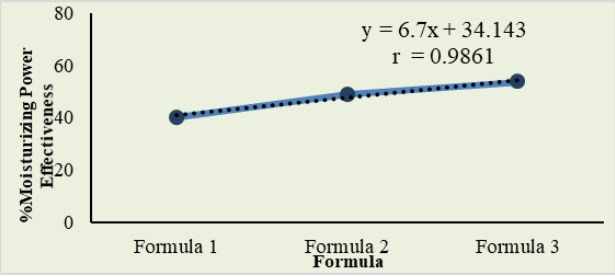

Figure 4. Graph showing the effectiveness of the moisturizing power of moisturizing cream preparations of orange melon fruit extract (*Cucumis melo* L. var. reticulatus) in various formulas.

Table 11. The results of testing the effectiveness of the moisturizing power of moisturizing cream preparations of melon orange fruit extract (*Cucumis melo* L. var. reticulatus).

Formula	% Moisturizing Power Effectiveness ($\bar{X}$ ±SD)
Formula 1	40.19 ± 0.35
Formula 2	48.85 ± 0.35
Formula 3	53.59 ± 0.59
Blank 1	32.79 ± 0.62
Blank 2	13.04 ± 0.58
Blank 3	43.44 ± 0.34

F count (5259.111) > F table (2,53; = 0.05) which shows a significant difference between formulas.

in the preparation. In Figure 5, the calculated r-value (0.9989) >r table (α = 0.05; 0.9969) means that the concentration of the extract and the antioxidant activity of the extract in the preparation have a significant relationship. The higher the concentration of melon orange extract in the preparation, the more antioxidants it contains, such as carotene, vitamin C, and other secondary metabolites[22]. These antioxidant compounds provide a lower absorbance so that when calculated, it gives a more significant % DPPH scavenging effect (antioxidant activity).

Based on the effectiveness of moisturizing power and antioxidant activity, the preparations that experienced an increase in the moisturizing power of the preparations also experienced an increase in the value of the antioxidant activity. Based on Figure 6, the r-value (0.9981)>r table (α = 0.05; 0.9969) means that is a significant relationship between antioxidant activity and the effectiveness of the moisturizing action of the gel. An increased extract concentration will increase the antioxidant activity.

Table 12. The results of testing the antioxidant activity of moisturizing cream preparations of orange melon fruit extract (*Cucumis melo* L. var. reticulatus) in various formulas.

Formula	%DPPH scavenging activity
Formula 1	83.33 ± 3.38
Formula 2	86.85 ± 1.97
Formula 3	89.70 ± 1.11

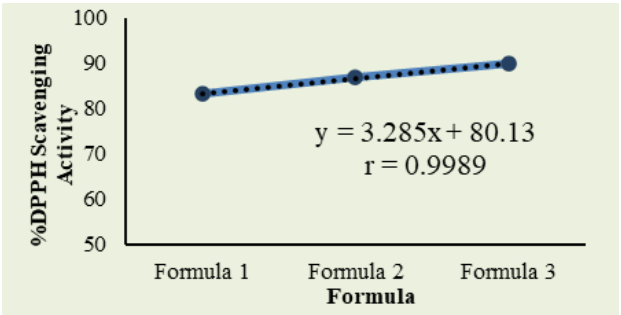

Figure 5. Graph showing the value of the antioxidant activity of moisturizing cream preparations of orange melon fruit extract (*Cucumis melo* L. var. reticulatus) in various formulas.

Formula F3 (30% melon orange extract concentration) is a formula that shows the most significant effect of moisturizing power and antioxidant activity, followed by preparation F2 and preparation F1.

Results of Qualitative Test of Efficacious Active Substance (Sucrose) in Moisturizing Cream Preparations Thick Extract of Orange Melon Fruit. The qualitative test of the active substance (sucrose) ensured that the thick extract of the orange melon (*Cucumis melo* L. var. reticulatus) produced from the juice extraction method still contained the efficacious substance sucrose. The thick extract of melon orange is expected to show a positive test result indicated by forming a dark purple ring between the two layers in the solution added with Molisch reagent and H_2S0_4. This indicates that the extracts and preparations still contain sucrose after the extraction and formulation processes. The results of the qualitative test of sucrose on melon orange extract, positive blanks (pure sucrose solution), and negative blank (aquadest) can be seen in Figure 7.

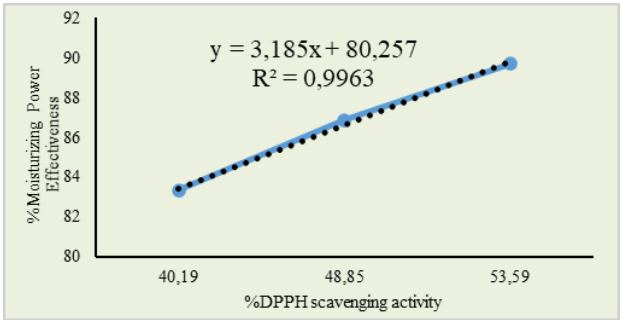

Figure 7. Graph showing the relationship between antioxidant activity and the effectiveness of the moisturizing power of moisturizing cream preparations of orange melon fruit extract (*Cucumis melo* L. var. reticulatus) in various formulas.

Stability Test Results for Orange Melon Fruit Extract Moisturizing Preparation. The stability test results found that the F3 preparation containing the melon orange extract at the highest concentration (30%) was unstable during four weeks of storage when viewed from the organoleptic aspect (color and odor) and pH. The extract tends to undergo an oxidation reaction during storage so that the acidity level of the extract increases and the pH value of the preparation decreases[23-25]. When the acidity level in the preparation increases, the material that functions as an anionic emulsifier, namely triethanolamine, will lose its emulsifying function and tend to be unstable, thus affecting the overall emulsion stability of the preparation[26].

Based on the results, it can conclude that an increase in the concentration of orange melon extract (*Cucumis melo* L. var. reticulatus) affects the physical quality aspects of the preparation: pH,

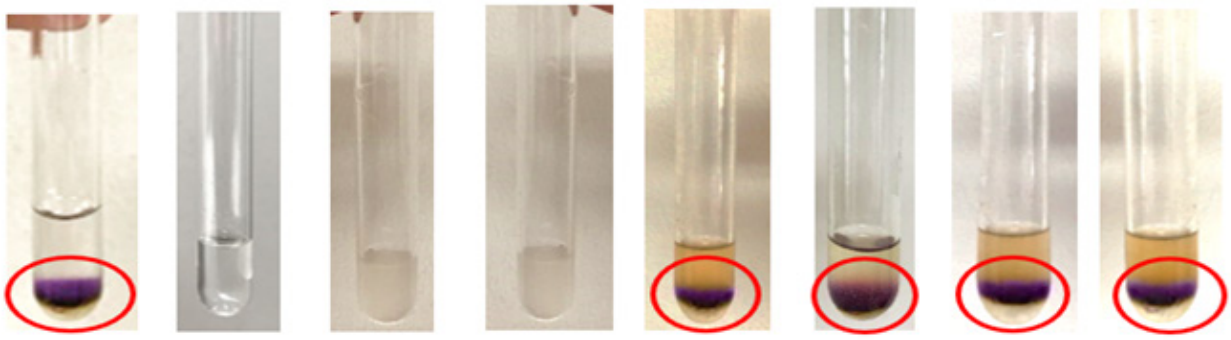

Figure 7. Molisch test observations on the comparison solution (sucrose) and moisturizing cream preparations in various formulas.

viscosity, dispersibility, water washability, adhesion, and effectiveness of the moisturizing power of the preparation. The formula chosen in this study was F2. The formula is the only formula that meets all the specifications for the physical quality aspect, has an excellent moisturizing effect of 48.85%, has an amazing antioxidant power of 86.68%, and is stable for a long time. Seeing the shortcomings of this study, the researchers suggested doing a pretreatment stage on the extract. At the pre-treatment stage, adding buffer compounds to the extract during the preformulation process is recommended to see if the extract can maintain its quality within the specified time. If the extract has been added, the buffer compound in the formula increases the preparation's stability during storage.

CONCLUSION

Increasing the concentration of orange melon extract (*Cucumis melo* L. var. reticulatus) from 10%, 20%, and 30% affected physical quality: pH, viscosity, spreadability, water washability, adhesion) and effectiveness of moisturizing power. Increasing the concentration of the extract in the preparation caused a decrease in pH value, spreadability, and washability of the preparation. It increased the

viscosity and stickiness of the preparation and the effectiveness of its moisturizing power. The addition of orange melon fruit extract had a significant effect in increasing the effectiveness of the moisturizing power of preparations containing synthetic humectants (glycerin and propylene glycol). In this study, the preparation of F2 (20% extract concentration) was the best formula that still met all the specifications of the physical quality test and had a moisturizing effect and antioxidant power.

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