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Research Article

Formulation Of Antioksidan *Sheet Mask* Preparation From A Combination Of Red Dragon Fruit Peel (*Celenicereus monacanthus* (Lem.) D.R. Hunt) And Kepok Banana Peel (*Musa paradisiaca* Var. Balbisiana) Ethanolic Extracts

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Abstract

The main problem of facial skin is premature aging triggered by free radicals. Antioxidants play an essential role in counteracting these radicals. Red dragon fruit peel (*Celenicereus monacanthus* (Lem.) D.R. Hunt) and kepok banana peel (*Musa paradisiaca* Var. *Balbisiana*) are natural sources rich in flavonoids with antioxidant potential. This study aimed to evaluate the physical characteristics and antioxidant activity of sheet mask formulations combining both extracts. The research was experimental, using the maceration method with 96% ethanol. The concentrated extracts were formulated into sheet masks at concentrations of (10:5)%, (15:5)%, and (20:5)%. Evaluation included organoleptic, pH, homogeneity, viscosity, irritation, and moisture tests using a skin analyzer. Antioxidant activity was determined using the DPPH method. Results showed that all formulations exhibited stable physical characteristics. The IC_{50} values were 42.59 ppm (FI), 33.74 ppm (FII), and 27.89 ppm (FIII), indicating very strong antioxidant activity. No irritation reactions such as redness, itching, or swelling were observed. Moisture increased up to 60% by the fourth week. In conclusion, the combination of red dragon fruit peel and kepok banana peel extracts is effective as a natural antioxidant ingredient for sheet masks, though further pharmacological and safety studies are recommended

Keywords: Sheet mask; Red Dragon Fruit; Kepok Banana; Antioxidant

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1 Introduction

The skin is the outer protective layer of the body that plays an important role in maintaining temperature, sensory function, and immunity. Facial skin is the most sensitive part and susceptible to various problems, one of which is dry skin (Kusumaningrum & Muhimmah, 2023). Dry skin conditions are caused by low moisture and oil content, which can make the skin look rough, scaly, and cracked (Yulianti et al., 2025). In Indonesia, the prevalence of dry skin is quite high, reaching 41.2% to 99.1%, especially in the elderly population due to excessive sun exposure (Nafi'ah et al., 2025). Excessive exposure to ultraviolet (UV) rays triggers the formation of free radicals (Reactive Oxygen Species / ROS), which accelerate skin aging through photoaging mechanisms, characterized by a decrease in skin moisture [15].

The negative effects of photoaging can be prevented with the use of antioxidants. Antioxidants work by neutralizing free radicals so that they can protect the skin from damage. Compared to synthetic antioxidants, natural antioxidants are a safer alternative because they have minimal side effects. Natural antioxidants are also known to inhibit the development of degenerative diseases (Prasetya et al., 2022).

One form of antioxidant application in skin care is the use of face masks (Sari et al., 2020). Face mask products, especially in the form of sheet masks, have become popular in Asia due to their practicality and ability to hydrate the skin. Sheet mask is a sheet-shaped mask soaked in a nutrient-rich serum solution. The advantage of this form is its nature as an occlusive dressing treatment (ODT) that increases the penetration of active ingredients into the skin, as well as hygienic and easy-to-use packaging [2].

However, currently many face masks are made from synthetic chemicals that are at risk of causing irritation, redness, and even long-term skin health problems (Pranata et al., 2020). Therefore, it is necessary to develop natural-based face masks that are safer and more environmentally friendly. Red dragon fruit peel (Hylocereus polyrhizus) and kepok banana peel (Musa paradisiaca L.) are fruit waste that has the potential to be a natural active ingredient because of its high flavonoid content and antioxidant properties.[16]

Previous research has shown that red dragon fruit peel extract has strong to very strong antioxidant activity, with a decrease in IC_{50} value with increased concentration (Putridhika et al., 2022). Likewise, the peel of the kepok banana fruit, which is reported to have higher antioxidant activity than other parts of the banana (Hasma and Winda, 2019). The combination of these two ingredients has been shown to produce lower IC_{50} values than single extracts, showing synergistic effects in increasing antioxidant potential [1].

Based on this background, this study was conducted to formulate a sheet mask preparation with a combination of red dragon fruit peel extract and kepok banana peel as a natural active ingredient. It is hoped that this formulation will be able to provide optimal antioxidant and moisture effects so that it can be further developed as a natural-based cosmetic.[20]

2 Method

2.1 Tool

The tools used in this study were aluminum foil, stirring rod, porcelain cup, blender, chemical cup, measuring cup, parchment paper, lumpang and pestle, measuring flask 100 ml and 10 ml, analytical balance, universal pH, dropper pipette, volume pipette, rotary evaporator, UV-Vis spectrophotometer, Skin analyzer, Spatula, Sudip, test tube, rion viscometer, and Maceration container.

2.2 Material

The ingredients used in this study were red dragon fruit peel extract (Hylocereus polyrhizus) and kepok banana peel (Musa paradisiaca L.), aquades, CMC Na, carbomer foil bag, glycerin, mask sheet, sodium benzoate, oleum rosae, propylene glycol, DPPH powder, and % powder vitamin C, sheet mask positive control (bioaqua-dragonfruit).

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2.3 Sampling

Red dragon fruit plant (Hylocereus polyrhizus) obtained from Sumber Sari Village, Moramo District, South Konawe Regency, Southeast Sulawesi. Meanwhile, the kepok banana plant (Musa paradisiaca L.) was obtained from Wataliku Village, Kabangka District, Muna Regency, Southeast Sulawesi.

2.4 Sample Processing

The skin of the red dragon fruit (Hylocereus polyrhizus) and the skin of the kepok banana (Musa paradisiaca L.) that have been collected and prepared, are sorted wet. Samples are weighed and recorded as initial weight. The sample is washed, sliced or cut into thin slices, then weighed to determine the wet weight. Then it is dried in the sun indirectly. Dry dissorption, then weighed dry weight (final simplicia weight). Then it is sprayed/mashed with a blender to obtain simplicia.

2.5 Sample Extraction

Extraction is carried out using the maceration method with 96% ethanol solvent for 3×24 hours, while occasionally stirring. The ratio between red dragon fruit peel powder and solvent is 1:5, which is 925.7 grams of powder extracted using 4,628.5 mL of 96% ethanol. Meanwhile, kepok banana peel powder was extracted in a ratio of 1:10, which was 690.2 grams of powder in 6,902 mL of 96% ethanol. The liquid extract from the filtration is collected to be vaporized with a rotary evaporator to obtain a viscous extract. The condensed extract is weighed for yield and stored at a low temperature and protected from sunlight. The formula for calculating the endowment is as follows:

$$\textbf{Extract Yield} = \frac{\textbf{Ekstract weight (g)}}{\textbf{Simplisia powder weight (g)}} \textbf{ x 100\%}$$

Table 1. Sheet Mask Preparation Formula Design Combination of Ethanolic Extract of Red Dragon Fruit Peel (Celenicereus monacanthus (Lem.) D.R. Hunt) and Kepok Banana Peel (Musa paradisiaca var. Balbisiana)

No.	Material	Use	Concentration (%)			
			F0	FI	FII	FIII
1.	Red dragon fruit peel extract	Active substances	0	10	15	20
	Kepok banana peel extract		0	5	5	5
2.	Glycerin	Emolient	2,5	2,5	2,5	2,5
3.	Propylene glycol	Humectant	15	15	15	15
4.	Carbomer	Penstable	0,2	0,2	0,2	0,2
5.	CMC Na	Viscosity enhancer	3	3	3	3
6.	Sodium Benzoate	Preservatives	0,1	0,1	0,1	0,1
7.	Oleum rosae	Deodorizer	7 drip	7 drip	7 drip	7 drip
8.	Aquades	Solvent	Ad 100	Ad 100	Ad 100	Ad 100

Information:

F0 : F0 Preparation Formulation
FI : FI Preparation Formulation
FII : FII Preparation Formulation
FIII : FIII Preparation Formulation

2.6 Preparation of Sheet Mask

Prepare the ingredients, then weigh all the ingredients according to the necessary calculations. Manufacturing begins with developing CMC Na little by little in some hot aquadest in the lumpang (mass I). Dissolved propylene glycol and Sodium benzoate in hot water (mass II). Mixed mass I and mass II (mass

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III). Developed carbomer with hot aquadest. After the gel mass is formed, glycerin (IV mass) is added, then mixed with mass III and grinded until homogeneous. Dragon fruit peel extract is

2.7 Organoleptic Test

The organoleptic test looked at the physical properties of the form in the form of color, odor, and texture of the sheet mask preparation that had been made. The color of the preparation corresponds to the specifications of the extract at the beginning of manufacture, has a semi-viscous liquid texture, and has a distinctive odor.

Homogeneity Test

The homogeneity test to find out if there is any unmixing or coarse particles to the preparation that has been made by placing the preparation between two glass objects and then observing.

pH Test

The pH test to determine the acidity level, namely with a pH of <7 or alkaline level >7 of a preparation, so as not to irritate the skin (acid) or make the skin dry (alkaline). The pH criteria of the skin range from 4.5-6.5.

Viscosity Test

The viscosity test aims to determine the level of viscosity of the preparation that has been made. The viscosity test was measured as much as 30 ml using a viscosity tool and the spindle was set to number 2 and a rotation speed of 30 rpm. The standard requirement for the viscosity of essence sheet mask is 230 -1150 cPs

Irritation Test

Irritate test to find out if there are side effects, after the preparation is applied to the skin. The irritation test is carried out preventively (patch test) by attaching a sheet mask preparation that has been cut 2 x 2 cm behind the earlobe for 30 minutes. The irritation test was conducted on 15 volunteers who were divided into 5 groups, each consisting of 3 people. The observed parameters of irritation are redness, swelling and itching.

Humidity Test

Moisture test to determine the preparation's ability to moisturize the skin by measuring the hydration value. The location of application of the preparation is in the skin test area of the hand by applying the preparation on the skin surface of the lower arm with a surface area of 2 x 5 cm,
ml measuring flask, then 96% ethanol is added to the limit mark.

Antioxidant Test

Preparation of DPPH solution 100 ppm (stock solution)

Weighing 10 mg of DPPH powder, put it in a 100 ml measuring flask, add a little 96% ethanol and then whisk to dissolve the DPPH and then add 96% ethanol to the limit mark. Then wrap the measuring flask in aluminum foil and incubate the solution for 30 minutes.

Manufacture of 100 ppm Preparation Master Solution

Weighing 10 mg of each formula, sheet mask preparation from a combination of red dragon fruit peel extract and kepok banana peel is dissolved in a 100 ml measuring pumpkin, then 96% ethanol is added to the limit mark, then beaten until homogeneous.

Preparation Series Solution Manufacturing

The series solution is made of 10 ml with 5 concentrations, namely 25 ppm, 20 ppm, 15 ppm, 10 ppm, and 5 ppm.

1. 25 ppm: A 2.5 ml of the parent solution of the preparation is put into a 10 ml measuring flask, then 96% ethanol is added.
2. 20 ppm: Pinch 2 ml of the parent solution of sheet mask preparation, put it into a 10 ml measuring flask, then add 96% ethanol until the limit mark.
3. 15 ppm: Squeezed 1.5 ml from the parent solution of sheet mask preparation, put into a 10

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4. 10 ppm: Pick up 1 ml of the parent solution of sheet mask preparation, put it into a 10 ml measuring flask, then add 96% ethanol to the limit mark.
5. 5 ppm: Pinched 0.5 ml of the parent solution of the preparation, put into a 10 ml measuring flask, then 96% ethanol is added.

Manufacture of Vitamin C Parent Solution 100 ppm

Weigh 10 mg of vitamin C and put it in a 100 ml measuring pumpkin, add 96% ethanol to the limit mark, then beat until homogeneous.

Vitamin C Series Solution Manufacturing

The series solution is made 10 ml with 5 concentrations, namely 2, 3, 4, 5, and 6 ppm.

1. 6 ppm: Squeezed 0.6 ml of the parent solution of vitamin C, put into a 10 ml measuring flask, then added 96% ethanol to the limit mark.
2. 3 ppm: Squeezed 0.3 ml of the parent solution of vitamin C, put into a 10 ml measuring
3. 2) 5 ppm: Pinch 0.5 ml of vitamin C parent solution, put it in a 10 ml measuring flask, then add 96% ethanol until the limit mark.
4. 3) 4 ppm: Siphon 0.4 ml of vitamin C parent solution, put it in a 10 ml measuring flask, then add 96% ethanol to the limit mark pumpkin, then add 96% ethanol to the limit mark.
5. 2 ppm: Squeezed 0.2 ml of vitamin C parent solution, put in a 10 ml measuring pumpkin, then 96% ethanol is added to the limit mark.

Antioxidant Activity Testing with the DPPH Method

The antioxidant activity test was carried out using the DPPH method. The determination of the maximum wavelength was carried out by measuring the absorbance of the solution on the UV-Vis spectrophotometer, using a maximum wavelength of 517 nm.

The test samples were in the form of sheet mask series solution and vitamin C mixture with 1 ml of DPPH 100 ppm solution, incubated for 30 minutes in a dark room at 25°C, and then measured for absorbance. The inhibition percentage is calculated using the formula:

$$\% \text{ Inhibition} = \frac{\text{Blank absorbance} - \text{sample bsorbance}}{\text{lank absorbance}} \text{ x } 100\%$$

3 Result and Discussion

Extract Immersion Results

Table 2. The result of soaking ethanolic extract of red dragon fruit peel and kepok banana peel

Sampel	Powder weight	Concentrated Extract Color	Construction	Bentuk	Concentrated extract weight	Result Yield
Red dragon fruit skin	925,7 gram	Dark brown yellow	Typical extracts	Thick extract	41,8 gram	4,5%
Kepok banana peel	690,2 gram	Dark brown yellow	Typical extracts	Thick extract	76,7 gram	11,1%

Organoleptic Test Results

Tabel 3. Organoleptic Test Results of Sheet Mask Preparations

Formula	Observation		
	Color	Construction	Shape
F0	Clear	Khas oleum rosae	semi-viscous liquid
FI	Light Brown	Khas oleum rosae	semi-viscous liquid

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FII	Medium chocolate	Khas oleum rosae	semi-viscous liquid
FIII	Dark chocolate	Khas oleum rosae	semi-viscous liquid
FK	Clear	Tidak berbau	semi-viscous liquid

Information:

F0 : F0 Preparation Formulation
FI : FI Preparation Formulation
FII : FII Preparation Formulation
FIII : FIII Preparation Formulation
FK : Formulation of Positive Control Preparation (Bioaqua Sheet mask)

Homogeneity Test Results

Tabel 4. Homogeneity Test Results of Sheet Mask Preparations

Formula	Observation of the week			
	I	II	III	IV
F0	Homogeneous	Homogeneous	Homogeneous	Homogeneous
FI	Homogeneous	Homogeneous	Homogeneous	Homogeneous
FII	Homogeneous	Homogeneous	Homogeneous	Homogeneous
FIII	Homogeneous	Homogeneous	Homogeneous	Homogeneous
FK	Homogeneous	Homogeneous	Homogeneous	Homogeneous

Information:

F0 : F0 Preparation Formulation
FI : FI Preparation Formulation
FII : FII Preparation Formulation
FIII : FIII Preparation Formulation
FK : Formulation of Positive Control Preparation (Bioaqua Sheet mask)

pH Test Results

Tabel 5. Hasil Pengujian pH Sediaan Sheet Mask

Formula	Pengamatan minggu ke-				Range (BSN, 1996).
	I	II	III	IV	
F0	5±0	5±0	5±0	5±0	4,5-8
FI	5±0	5±0	5±0	5±0	4,5-8
FII	5±0	5±0	5±0	5±0	4,5-8
FIII	5±0	5±0	5±0	5±0	4,5-8
FK	5±0	5±0	5±0	5±0	4,5-8

Information:

F0 : F0 Preparation Formulation
FI : FI Preparation Formulation
FII : FII Preparation Formulation
FIII : FIII Preparation Formulation
FK : Formulation of Positive Control Preparation (Bioaqua Sheet mask)

Viscosity Test Results

Table 6. Viscosity Test Results of Sheet Mask Preparations

Formula	Observation of the Week				Range (Hanifah dkk, 2023)
	I	II	III	IV	
F0	40±0 dPas	40±0 dPas	40±0 dPas	40±0 dpas	230-1150 cPs
F1	30±0 dPas	30±0 dPas	30±0 dPas	30±0 dPas	230-1150 cPs
F2	30±0 dPas	30±0 dPas	30±0 dPas	30±0 dPas	230-1150 cPs

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F3	30±0 dPas	30±0 dPas	30±0 dPas	30±0 dPas	230-1150 cPs
FK	30±0 dPas	30±0 dPas	30±0 dPas	30±0 dPas	230-1150 cPs

Information:

F0 : F0 Preparation Formulation
FI : FI Preparation Formulation
FII : FII Preparation Formulation
FIII : FIII Preparation Formulation
FK : Formulation of Positive Control Preparation (Bioaqua Sheet mask)

Irritant Results

Tabel 7. Irritation Test Results of Sheet Mask Preparations

Formula	Volunteers	Irritant reactions		
		Redness	Itch	Swollen
F0	1	-	-	-
	2	-	-	-
	3	-	-	-
F1	4	-	-	-
	5	-	-	-
	6	-	-	-
F2	7	-	-	-
	8	-	-	-
	9	-	-	-
F3	10	-	-	-
	11	-	-	-
	12	-	-	-
FK	13	-	-	-
	14	-	-	-

Information:

F0 : F0 Preparation Formulation
FI : FI Preparation Formulation
FII : FII Preparation Formulation
FIII : FII Preparation Formulation
FK : Formulation of Positive Control Preparation (Bioaqua Sheet mask)
\+ : Redness
++ : Itch
+++ : Swollen
\- : No irritation occurs

Humidity Test Results

Tabel 8. Moisture Test Results of Sheet Mask Preparations

Formula	Moisture (%)					Range (Suryani dkk, 2024)
	Initial conditions	Week I	Week II	Week III	Week III	
FO	44	47	55	59	60	51-100% (hydration)
	32	39	42	59	60	
	20	32	41	56	60	
Average ± SD	29 ± 17	42 ±5	46 ± 5	58 ± 1,7	60 ± 0	
FI	10	36	41	44	60	
	32	45	59	60	60	

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	15	36	59	60	60
Average ± SD	19 ±12	39 ±5	53 ±10	55 ±9	60 ± 0
FII	41	45	48	55	60
	38	44	55	59	60
	39	44	45	54	60
Average ± SD	39 ± 1,5	44,3±0,6	49 ± 5,1	56 ± 2,6	60 ± 0
FIII	41	59	55	59	60
	59	59	59	60	60
	36	44	48	56	60
Average ± SD	45,3±12	54 ± 8,7	54 ± 5,6	58,3±2,1	60 ± 0
FK	41	48	55	59	60
	35	48	56	59	60
	38	45	49	55	56
Average ± SD	38 ± 3	47 ± 1,7	53,3±3,8	57,7±2,3	58,7±2,3

Keterangan:

F0 : Blanco
FI : Formulation I
FII : Formulation II
FIII : Formulation III
FK : Control positif (Sheet mask Bioaqua)

Antioxidant Activity Test Results

Tabel 9. Antioxidant Activity Test Results

Sample	**IC_{50} (ppm)**
FI	42,59
FII	33,74
FIII	27,89
Red Dragon Fruit Peel Extract	82,93
Kepok Banana Peel Extract	96,70
Vitamin C	2,10

The study was conducted to determine the physical characteristics *of sheet mask preparations* in combination with ethanolic extracts of red dragon fruit peel (*Celenicereus monacantus* (Lem.) D.R. Hunt) and kepok banana peel (*Musa paradisiaca* Var. Balbisiana) and to find out the antioxidant activity of the preparation using the DPPH method.

The samples used in this study were red dragon fruit peel (*Celenicereus monacantus* (Lem.) D.R. Hunt) and kepok banana peel (*Musa paradisiaca* Var. Balbisiana) as the main ingredient based on its local availability, cultivation potential, and antioxidant content.

The skin of the red dragon fruit (*Celenicereus monacantus* (Lem.) D.R. Hunt) is obtained from fresh fruit picked in Sumber Sari Village, Moramo District, South Konawe Regency, Southeast Sulawesi. Meanwhile, kepok banana peel was obtained from Wataliku Village, Kabangka District, Muna Regency.

The combination of red dragon fruit peel and kepok banana peel because both contain flavanoid compounds that have the potential to be antioxidants, which work by capturing free radicals by donating hydrogen atoms or proton atoms to radical compounds, thereby stopping free radical chain reactions and making free radicals more stable (Riskianto, 2021). So that the combination of these two main ingredients provides a synergistic effect that is able to produce a smaller IC_{50} value than if a single extract is used, which means that the antioxidant power is greater which makes it more effective at neutralizing free radicals [1].

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Samples of red dragon fruit peel (*Celenicereus monacantus* (Lem.) D.R. Hunt) and kepok banana peel (*Musa paradisiaca* Var. Balbisiana) in this study was first determined at the Pharmacogno-Phytochemistry Laboratory of Mandala Waluya University to ensure the correctness of the species used. The determination results were strengthened through a certificate with the number: 027/09.03.01/VII/25 for red dragon fruit peel and 028/09.03.01/VII/25 for kepok banana peel. Extraction was carried out by the maceration method using a 96% ethanol solvent chosen because it is effective in dissolving flavonoid compounds that are polar, in accordance with the literature that states that 96% ethanol produces a higher flavonoid content compared to 70% ethanol [8].

The extracts obtained can be seen in Table 2, are extracts in the form of a thick yellow brown and have a distinctive aroma of extracts. The soaking of red dragon fruit peel extract was 4.5% and the kepek banana peel was 11.1%. Based on (Indonesian Herbal Pharmacopoeia, 2017), a good soaking of thick extract is not less than 10%. Therefore, the soaking of kepok banana peel is considered to meet the standards of the Herbal Pharmacopoeia. While the skin of the red dragon fruit is lower. This is likely influenced by the type of solvent, size of simplicia, and extraction time, as explained by (Pujiastuti & Demby, 2021) solvents using 70% and 90% ethanol produce different soaking with higher soaking in 70% ethanol solvents because they contain larger OH groups so they are more polar but do not produce optimal levels of flavonoid compounds. So despite the low yield, 96% ethanol still yields higher levels of flavonoid compounds that have the potential to be antioxidants which is the activity needed in this test.[16]

The formulation of sheet mask preparations is based on the manufacture of gel base, where the gel base used consists of Carbomer and CMC Na. Carbomer was chosen as the base component because it is easily soluble in water, helps the dispersion of active ingredients to the surface of the skin, and is able to release active ingredients well. However, the acidic nature of carbomers can increase the pH of the preparation when used in high concentrations. Therefore, carbomers are used in low concentrations with the primary function of stabilizer, not as viscosity enhancer. CMC-Na was chosen as a carbomer pair because it has alkaline properties that can help balance the pH of the preparation, while also acting as a viscosity enhancer that provides stable viscosity to the preparation. With this combination, the resulting preparation remains stable, has a suitable viscosity, and its pH is expected to be within the skin's pH range. The base between Carbomer and CMC Na was developed separately using hot aquades. CMC Na base consists of propylene glycol additives as a humectant and sodium benzoate as a preservative to make the gel base stable by forming a gel that can be stored for a long period of time. The carbomer base consists of an additional ingredient, namely glycerin as an emollient. Both bases are mixed and the addition of active ingredients red dragon fruit peel extract and kepok banana peel as a nourisher to the skin will be released through the gel base. Another additional ingredient is *oleum rosae* as a flavoring to cover the unpleasant smell of extracts, so that the addition of fragrance minimizes the unpleasant smell of the extract and makes it comfortable when used [12,22].

The results of organoleptic observations of *sheet mask* preparations can be seen in Table 3. Observation was observed directly using the sense of touch regarding changes in form in the form of color, smell, and texture of *sheet mask preparations* [9]. Organoleptic observations were carried out for formula of bioaqua on the market. All formulas, with or without extracts, still appear uniform as the active ingredients and additives are evenly mixed. This indicates that the mixing process is going well and that the preparation has the appropriate homogeneity from the start. So that on all preparations it is stable for 4 weeks of storage.[4,19]

The pH test can be seen in Table 5, This test was carried out for 4 weeks where the average value in the first week to the fourth week was known to be no change either in the decrease or increase in pH, which remained 5, the preparation of the positive control formula there was no difference between the two remained the same, namely pH 5. The pH value of *sheet mask preparations* combined with ethanolic extract of red dragon fruit peel (*Celenicereus monacantus* (Lem.) D.R. Hunt) and kepok banana peel (*Musa paradisiaca* Var. Balbisiana) has met the requirements for the skin pH range according to SNI 16-3499-

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1996, which is 4.5–8, so that the preparation is safe to apply to the skin. This indicates that the preparation has good pH stability and indicates that the extract components or additives do not cause interactions that can affect the acidity degree of the preparation Viscosity testing aims to determine the level of viscosity of a preparation that greatly affects the release of active substances (Suryani et al., 2024). The higher the viscosity, the slower the release of the active substance of *the sheet mask* preparation, the lower the viscosity, the faster the *sheet mask preparation* releases the active substance. Based on the observation results of Table 6, the viscosity results measured using the rion viscometer (*vt-06*) with rotor no. 2, that all *sheet mask* preparations were stable for 4 weeks with viscosity test results showing that the blank formula (F0) had a viscosity of 40 dPas, while the formula with the addition of extracts (FI, FII, FIII) and positive control formula (FK) was recorded at 30 dPas. This difference indicates that the addition of extracts causes a decrease in the viscosity of the preparation due to the interaction of the extract components with the gel matrix so that it can loosen the polymer bonds by decreasing the density of the gel tissue. [3]

However, the addition of extracts with progressively higher concentrations of (FI, FII, FIII) does not cause a decrease in viscosity, but rather produces almost the same value. This can be explained by the method of mixing the gel base with the amount of extract added little by little so that the gel base is able to rebind and maintain its consistency. This shows that all *sheet mask* formulas meet the standard viscosity range *of essence sheet* masks from the study (Hanifah *et al*., 2023) (230–1150 cPs) which are converted by dPas units to (23-115 dPas). It remains stable for four weeks of storage. The addition of the extract only had an effect on the initial decrease in viscosity, whereas the difference in concentration between the formulas had no further effect as the gel base was able to rebalance its bond structure.

Irritant testing to determine the safety of the preparation on the user's skin. Based on Table 7, the results of *sheet mask* preparation on all formulas (F0, FI, FII, and FIII and FK) were carried out on 15 volunteers with each formula group consisting of 3 volunteers with certain criteria, did not cause an irritating reaction in all volunteers. This is because there are no signs of redness, itching or swelling because this preparation meets the skin's pH standards so that the preparation is safe to use on the skin and does not cause side effects.

Moisture testing aims to find out whether the resulting preparation is able to moisturize the skin by measuring the hydration value using *a skin analyzer* on the arm whose purpose is to initially tolerate the potential reaction of the product, where the skin of the arm is more stable and less sensitive than the facial area, hydration measurement in 15 volunteers with each formula group consisting of 3 volunteers with certain inclusion criteria. This grouping aims to be a formula replication data so that the results obtained are not based on one individual if there are different results, data replication can minimize the influence of distorted data. Based on Table 8, the moisture results after the use of *sheet mask* experienced an increase in moisture levels from week I to week IV with the average moisture values of F0, FI, FII, and FIII showing the most optimal results with an average final moisture value until week IV exceeding normal skin moisture, which is 60% which is in the hydration category (51-100%) which is very moist. This is because additives in the form of humectants (propylene glycol) and emollients (glycerin) have a high ability to attract and maintain moisture content by maintaining moisture in the skin layer. Meanwhile, FK preparations (positive control formula of bioaqua *sheet mask* preparations) experienced an increase in humidity until the fourth week with an average final value of IV also exceeding normal skin moisture of 58.7± 2.3% including the hydration category (51-100%) which is very moist but the moisture value is lower than *sheet mask preparations* (F0, FI, FII, and FIII) due to the difference in components of the ingredients and concentrations used.[9]

The antioxidant activity test in this study was carried out using the DPPH method. The testing of antioxidant activity in this study can be seen in Table 9, by comparing the IC_{50} value of a single extract of red dragon fruit peel and kepok banana peel, and sheet *mask* preparation against vitamin C as a positive control (comparator). The use of vitamin C comparators, because as a natural antioxidant comparison

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compound is relatively safe and does not cause toxicity. Use of vitamin C comparators to find out how strong the antioxidant potential is in the test sample. If the sample's IC50 value is the same or close to the comparative IC50 value, it can be said that the sample has the potential to be a very powerful antioxidant alternative [10].

The IC_{50} value of a single extract of red dragon fruit peel was 82.93 ppm while a single extract of kepok banana peel was 96.70 ppm. Both extracts belong to the category of strong antioxidant activity (50-100 ppm). With the combination of red dragon fruit peel extract and kepok banana peel formulated into *sheet mask* preparation, it showed antioxidant activity with IC50 values of 42.59 ppm (FI), 33.74 ppm (FII) preparations in each treatment, all formulas (F0, FI, FII, and FIII as well as FK) [11].
and 27.89 ppm (FIII). All three formulations fall into the category of very potent antioxidants (<50 ppm). The results showed that the increasing antioxidant activity was characterized by a decrease in the IC_{50} value due to the increased concentration of each formula and the antioxidant activity produced was very strong, the effect of the combination of red dragon fruit peel and banana peel kepok that the antioxidants produced were better than the use of a single extract because the two extracts cooperated with each other, It provides a synergistic effect as an antioxidant in soaking free radicals. The IC_{50} value in the vitamin C comparison of 2.10 ppm belongs to the category of very strong antioxidants (<50 ppm) so that this sample combination is close to the natural antioxidant strength of the monitoring sample, namely vitamin C.

4 Conclusion

Based on the results of the study, the researcher can draw the following conclusion. *Sheet mask* preparation is a combination of ethanolic extract of red dragon fruit peel (*Celenicereus monacantus* (Lem.) D.R. Hunt) and kepok banana peel (*Musa paradisiaca* Var. Balbisiana) meets the quality requirements of the physical characteristics of *sheet mask preparations*, namely in the form of organoleptic, homogeneity, pH, and viscosity tests along with meeting moisture and irritation tests. Sheet mask *preparation* of a combination of red dragon fruit peel extract (*Celenicereus monacantus* (Lem.) D.R. Hunt) and kepok banana peel (*Musa paradisiaca* Var. Balbisiana) provides antioxidant activity, namely IC_{50} of 42.59 ppm (FI), 33.74 ppm (FII), and 27.89 ppm (FIII) all belong to the category of very strong antioxidant activity (IC50<50 ppm).

5 Declarations

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5.2 Author contributions

Wa Ode Ardianti conducted data collection and laboratory measurements of random blood glucose levels. Nur Awaliyah Halid supervised the study design, provided methodological guidance, and reviewed the manuscript critically. Nur Herlina Nasir contributed to instrument preparation, data verification, and literature analysis. Wa Ode Ardianti performed statistical analysis, interpreted the results, and assisted in manuscript drafting. All authors read and approved the final version of the manuscript and agreed to be accountable for the accuracy and integrity of the work.

5.3 Conflict of Interest

The authors declare no conflict of interest.

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