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Determination of Sun Protection Factor Lotion of Pulai Stem Extract (*Alstonia scholaris* (L.) R.Br)

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Abstract

BACKGROUND: The bark of pulai (*Alstonia scholaris* [L] R.Br.) by the Gorontalo community is used for powder preparation (as a wedding ceremony custom), containing flavonoid compounds that function as sunscreens. Thus, the bark of pulai can be made in pharmaceutical preparations in the form of lotion dosage forms.

AIM: This study aims to determine the SPF value of the lotion preparation of pulai bark extract. There are four formulas, formula F0 (lotion base), formula F1 (0.5%), formula F2 (1%), formula F3 (2%).

METHODOLOGY: Physical evaluation of lotion preparations was carried out with organoleptic test parameters, spreadability, homogeneity, stability, pH. The SPF value of the lotion preparation was tested using the ultraviolet-Vis Spectrophotometry method with a wavelength of 290–400.

RESULTS: The results of the physical evaluation of the organoleptic test and the homogeneity test were obtained that the lotion had a clear white color (F0), light yellow (F1), yellow (F2), dark yellow (F3), a characteristic smell of olive oil, and the four formulas had a thick and homogeneous consistency. The dispersion power of F0, F1, and F2 does not meet the requirements of the dispersion test value except F3. The three lotion formulations F1, F2, and F3 showed physical instability, except for F0 (lotion base). The pH of the lotions of the four formulas was in the range that was in accordance with the standard of topical preparations.

CONCLUSION: The determination of the SPF value in the formulas F1, F2, and F3, respectively, was 3.3427 (minimum protection), 4.7752 (medium protection), and 5.0968 (medium protection).

Introduction

The sun's rays that harm the skin are ultraviolet (UV) radiation. The impact of sun exposure can also cause photoaging. It is estimated that 80% or more of changes in the skin that occur over time are caused by the extrinsic effects of sunlight [1], [2]. The skin is the largest organ of the human body and functions as a physical, biological, and physiological barrier. These factors trigger various signs of aging skin, which are generally characterized by the formation of fine wrinkles, reduced water content, and reduced skin thickness. Wrinkles or photoaging of the upper dermis are closely related to collagen/elastin-based connective tissue, while wrinkles are formed by degradation of the extracellular matrix through changes in matrix metalloproteinase (MMP) levels [3].

The sun protection factor (SPF) is an international laboratory measure used to assess the efficacy of sunscreens. The SPF can range from 1 to over 80 and indicates the time a person can be exposed to UV rays before getting sunburn with sunscreen application relative to the time a person can be exposed without sunscreen. SPF levels are determined by the minimal amount of UV radiation that can cause erythema and/or pain stimulated by UV light [4]. According to (Daud, *et al*, 2018) [1], the concentration of extracts that provide the ability to protect the skin from exposure to UV rays with the ultra protection category is 7.5%.

Pulai plant (*Alstonia scholaris* [L.] R.Br) is one of the medicinal forest plants that is rich in active compounds. Part of the island. Plants that are commonly used are leaves, stems, and bark. The bark of the pulai extract contains flavonoids, alkaloids, saponins, tannins, and terpenoids [3], [5], [6]. The bark of the pulai contains flavonoid compounds that are effective antioxidants. Due to the presence of these antioxidants, the antioxidant mechanism can attract free radicals caused by frequent sun exposure, anti-cancer drugs, anti-malaria drugs, hypertensive drugs, respiratory drugs, analgesics, anti-inflammatory drugs, and anti-malaria.In addition, Pulai can also be used as

a cure for hepatitis, tumors, rheumatism and earache [6], [7], [8], [9].

Empirically, the people of Gorontalo use the bark of the island for powder preparations (as preparation for the wedding ceremony). Judging from the efficacy and content of compounds contained in the Pulai plant (*A. scholaris* (L.) R.Br), the bark extract of the Pulai is very suitable for making lotion preparations in a predetermined concentration formula. Then, the lotion formed will be continued with the SPF testing method. To facilitate its use on the body's skin, it can be made in pharmaceutical preparations as a UV ray protector, namely sunscreen lotion.

Based on the description above, the authors are interested in conducting research on Determining the Value of SPF Lotion of Batang Pulai Bark Extract (*A. scholaris* (L.) R.Br) using the UV-VIS spectrophotometry Method.

Methods

Tool

Stirring Rod, Glass Beaker, Maceration Vessel, Caliper, Micropipette, Analytical Balance, Oven, UV-Vis (Shimadzu UV-1800®), Horn Spoon, Test Tube, and pH Meter (Senz pH®).

Ingredient

Pulai Bark from Potanga Pilolodaa (Gorontalo Province), Stearic Acid (CV. Chem-Mix P.A Grade), Aquadest (Department Pharmacy Chemistry Laboratory Polkesgo, Pharmaceutical Grade), Ethanol 70% (CV. Chem-Mix P.A Grade), Ethanol 96% (CV. Chem-Mix P.A Grade), Glycerin (CV. Chem-Mix P.A Grade), Methyl Paraben (CV. Chem-Mix P.A Grade), Olive Oil (CV. Chem-Mix P.A Grade), Cetyl alcohol (CV. Chem-Mix P.A Grade), Tween 80 (CV. Chem-Mix P.A Grade), Mg Powder (CV. Chem-Mix P.A Grade), HCl (CV. Chem-Mix P.A Grade), FeCl3 10% (CV. Chem-Mix P.A Grade), Mayer reagent and Dragendrof reagent (CV. Chem-Mix P.A Grade).

Preparation of Simplicia Bark Pulai

The bark of the pulai was taken and then washed with running water; then wet sorting was carried out to separate the dirt that was still left behind during washing, chopped into small pieces and then dried in the oven at 50°C until it reached a moisture content of <10% [9].

Then calculated % water content with the following formula.

% Moisture Content = (initial weight-final weight)/(initial weight) × 100%

Table 1 : Formula of Pulai Bark extract lotion

Ingredient	Function	Concentration (%b/v)			
		F_0	F_1	F_2	F_3
Puli bark extract	Active substance	-	0.5	1	2
Stearic acid	Emulsifying	2.5	2.5	2.5	2,5
Cetyl alcohol	Emollient	2	2	2	2
Glycerin	Humectant	10	10	10	10
Olive oil	Humectants	-	5	5	5
Tween 80	Emulgator	10	10	10	10
Methyl paraban	Preservative	0.02	0.02	0.02	0.02
Aquadest	Solvent	83.02	76.78	76.42	75.35

Description: F_0: Negative control formula (lotion formula without active substance), F_1: Lotion formula with 0.5% extract concentration, F_2: Lotion formula with 1% extract concentration, F_3: Lotion formula with 2% extract concentration.

Preparation of Pulai Bark extract

Withdrawal of chemical compounds in the bark extract of pulai was carried out by maceration method for 3 × 24 h protected from light and occasionally stirring. Extraction using 70% ethanol solvent with a ratio of 1:3,5. On the 2nd and 3rd days, the solvent was filtered for remaceration so as to get three filtrates for each solvent so that the filtrate was obtained. The filtrate was concentrated with a rotary evaporator at a temperature of 60°C [10].

Pulai Bark phytochemical Screening

Handling Simplicia samples and Pulai Bark extract

A total of 6 g of simplicia of pulai bark extract and 0.5 g of pulai bark extract were dissolved in 30 ml of methanol and then filtered. The filtrate obtained was used added with each reagent [11], [12].

Identification of alkaloids

Mayer test

The experimental solution was taken 2 ml, then added five drops of mayer; a positive result was indicated by the formation of a white precipitate.

Dragendorff test

The experimental solution was taken 2 ml, then added five drops of Dragendorff; a positive result was indicated by the formation of an orange–brown precipitate [12].

Identification of flavonoids

A total of 2 ml of the sample was added with 0.05 g of Mg powder and 1 ml of concentrated HCl, then shaken vigorously. Positive results are indicated by the formation of red, intense yellow, or orange colors [12].

Identification of tannins

Take 2 ml of sample and add ten drops of 10% FeCl3. Positive results contain tannins if there is a green–black or blue–black color change [12].

Identification of Saponins

A total of 2 ml of extract was added with 10 ml of water while shaking for 1 min. If the foam formed remains stable for approximately 7 min, then the extract is positive for saponins [12].

Preparation of Pulai Bark extract lotion

Prepare tools and materials to be used. The ingredients in the oil phase (stearic acid, cetyl alcohol, tween 80, and olive oil) were put into a porcelain cup. The water phase ingredients (aquadest, glycerin, and methylparaben) were put into a beaker. Heated the oil phase and the water phase and stirred at a temperature of 70°C–75°C separately until homogeneous, then mixed at a temperature of 70°C, while stirring until both phases were homogeneous. The active substance of the ethanol extract of the bark of the pulai was added to the mixture at a temperature of 35°C, then stirred for approx. 1 min [13].

Determination of SPF value of Pulai Bark extract lotion

Each lotion formula was made in a concentration of 100 ppm by weighing 2 g of each lotion sample F0 (-), F1, F2, and F3 dissolved in 100 ml (Table 1). The solution obtained is filtered if the solution is cloudy. The absorbance obtained was measured using a UV-Vis spectrophotometer at a wavelength of 290-400 nm to determine the SPF lotion value.

The determination of the SPF value is calculated using the following formula [2].

- $AUC = \left(\frac{Serapan\lambda n + Serapan\lambda n + 1}{2} \right) (\lambda_{n+1-} \lambda_n)$
- $\Delta AUC = L_1+L_2+L_3+L_4+L_5+L_6$
- $Log\ SPF \left(\frac{\Delta AUC}{\lambda maks + \lambda min} \right) \times 2$
- SPF = Arc. Log SPF

Description:

AUC = Area of Absorption Curve

λ_n = Largest wavelength (with A ≥ 0.05 for extract; with A ≥ 0.01 for preparation)

λ_{n+1} = The smallest wavelength (290 nm)

L = Result of AUC value.

Evaluation of physical properties of Pulai Bark extract lotion

Organoleptic Test

The organoleptic test of the lotion preparation was carried out by observing the physical appearance of the lotion preparation, which included color, odor, and consistency [14].

Spreadability Test

A total of 0.5 g of ointment is placed on a round glass with a diameter of 15 cm; another glass is placed on it and left for 1 min. The diameter of the distribution of the preparations was calculated for the diameter. After that, 100 g of additional load were added and allowed to stand for 1 min, and then, a constant diameter was calculated [15].

Homogeneity Test

Each lotion formula is weighed 0.1 g, spread evenly on a glass object, and no coarse grains should be seen.

Stability Test

Stability test was carried out to test the preparations were Freeze Thaw for three cycles. One cycle which is 48 h consisting of 24 h at 4°C and 24 h at 40°C [15].

pH test

Weighed as much as 1 g of lotion preparation and then diluted with 10 ml of distilled water. Then, a pH meter is used to measure the pH of the lotion preparation [16].

Results and Discussion

Water content of Simplicia Bark Pulai

Moisture content is a parameter to determine residual water after the drying process [17].

The results of the water content are shown in Table 2.

Table 2: Water content of Pulai Bark

Initial weight	Final weight	Moisture content
7.000 g	3.085 g	4%

The results of the water content are obtained from the process of making simplicia that meet the quality requirements of the water content. The requirement for simplicia water content in accordance with the quality is 10%. Water content that is too high (>10%) can cause the growth of microbes which will reduce the stability of the simplicia and extract and affect the resistance to storage. Hence that the low water content will make the material storage longer [11], [17].

Pulai Bark extract yield

Yield is the ratio of the dry weight of the resulting sample to the weight of the raw material. The

yield of a sample is very necessary because it is to determine the amount of extract obtained during the extraction process. In addition, the yield data has to do with the active compound from a sample. Hence, the higher the yield of the resulting extract, the higher the active compound contained in the sample [18].

The yield of the Pulai bark extract is shown in Table 3.

Table 3: Yield results of Batang Pulai Bark extract

Sample	Weight Simplicia	Extract	Yield
Etanol 70% Pulai Bark	3.000 g	36 g	1,2 %

Based on the table above, the yield results are below the standard yield value, so that the extract obtained is very little. According to Ramadhani *et al*. [19], the standard extract yield value is >10%. This is due to the amount of solvent used. In this study a solvent ratio of 1:3.5 was used, while in the study (Zuraida dan Mariya, 2019) [5] the extraction of the bark of the pulai used the amount of solvent in a ratio of 1:10. And other factors that affect the yield are plant varieties, plant age, plant maintenance processes, environmental factors where plants grow, harvest processes, and plant processing processes [9].

Results of phytochemical screening

Phytochemical screening is the initial stage to identify the chemical content or chemical compounds contained in plants. Phytochemical screening is a qualitative analysis of secondary metabolites using reagents [12].

Table 4: Phytochemichal screening in Pulai Bark simplicia

Chemical content	Reactor	Test parameter results	Research result	Note
Alkaloids	Mayer's reagent	White precipitate	White precipitate	Positive (+)
	Dragendrof's reagent	Orange to brown precipitate	Orange precipitate	Positive (+)
Flavonoids	Concentrated Mg + HCl	Red, yellow or orange	Yellow	Positive (+)
Tannins	$FeCl_3$ 10%	dark green or dark blue	Yellow	Negative (−)
Saponins	Hot water	There is a foam that can last for 7 min	No foam	Negative (−)

The results of the phytochemical screening of simplicia and the bark extract of pulai are shown in Tables 4 and 5.

Table 5: Phytochemichal screening in Pulai Bark extract

Chemical content	Reactor	Test parameter results	Research result	Note
Alkaloids	Mayer's reagent	White precipitate	White precipitate	Positive (+)
	Dragendrof's reagent	Orange precipitate	White precipitate	Positive (+)
Flavonoids	Concentrated Mg + HCl	Red, yellow or orange	Yellow	Positive (+)
Tannins	$FeCl_3$ 10%	Dark green or dark blue color	Light brown color	Negative (−)
Saponins	Hot water	There is a foam that can last for 7 min	No foam	Negative (−)

Based on the table above, the phytochemical screening of simplicia and extracts of the bark of the bark of pulai was found to be positive for containing alkaloids and flavonoids. This is in accordance with research conducted by [20] that the simplicia of the bark of the Pulai stem is positive for alkaloids and flavonoids.

In the Tannin test, it was found that the simplicia and the bark extract of pulai were negative. This is different from the research conducted by [21]. This is due to the differences in the extraction methods used. In his research, the extraction method for the withdrawal of tannin compounds used the reflux method, while in this study using the maceration method. Tannin compounds are complex compounds that can only be attracted with the help of heating, so that the reflux method is suitable for attracting tannin compounds.

In the saponin test, it was found that the simplicia and the bark extract of pulai were negative. This is due to the use of different reagents. In a study conducted by Itam *et al*. [22], the saponin test after adding hot water, shaking for a few minutes, positive results were indicated by the formation of foam that did not disappear after adding HCl. Whereas in this study, only hot water was used and no foam was formed. The function of adding HCl is to accelerate the reaction in the saponin test, which is characterized by the formation of foam.

Result of determination of value (sun protection factor) preparation of Pulai Bark extract lotion

The SPF value indicates the ability of a sunscreen product to reduce burning on the skin caused by UV rays or a product that acts as a UV protector [23]. The results of the SPF test are shown in Table 6.

Table 6: Results of determining the value of sun protection factor pulai bark extract lotion

Wavelength	Absorbance			
	Formula F_0	Formula F_1	Formula F_2	Formula F_3
290	0.043	0.743	1.0429	1,2095
295	0.025	0.696	0.9776	1.1035
300	0.020	0.665	0.9283	1.0187
305	0.0163	0.6345	0.8763	0.9282
310	0.0138	0.6105	0.8336	0.8565
315	0.011	0.5946	0.8058	0.8139
320	0.010	0.5839	0.7878	0.7904
325	0.0091	0.5737	0.7717	0.7810
330	0.0082	0.5625	0.7521	0.7624
335	0.0070	0.5479	0.7272	0.7335
340	0.0063	0.5316	0.6973	0.7056
345	0.0051	0.5151	0.6657	0.6760
350	0.0043	0.4962	0.6338	0.6475
355	0.0037	0.4796	0.6043	0.6173
360	0.0032	0.465	0.5788	0.5867
365	0.0028	0.4534	0.5573	0.5650
370	0.0025	0.4437	0.5398	0.5499
375	0.0018	0.435	0.5255	0.5360
380	0.0017	0.428	0.5127	0.5273
385	0.0019	0.421	0.5016	0.5146
390	0.0017	0.4144	0.4912	0.5041
395	0.0014	0.408	0.4141	0.4950
400	0.0011	0.4023	0.4718	0.4859
ΔAUC	1.71075	57.66125	74.69925	77.804
SPF logs	0.0155	0.5241	0.6790	0.7073
SPF value	1.0363	3.3427	4.7752	5.0968

SPF: Sun protection factor, AUC: Area under the curve.

Based on the data obtained in the table above, it shows that Formula F0 is a lotion base that does not have effectiveness as a sunscreen because it has a value below the minimum protection value. Formula F1, which added the active substance of pulai bark with a concentration

of 0.5% had an SPF value of 3.3427 with a minimal protection category, Formula F2, which added the active substance of the bark of pulai with a concentration of 1% had an SPF value of 4.7752 with the protection category medium, Formula F3 which added the active substance of pulai bark with a concentration of 2% had an SPF value of 5.0968 with a moderate protection category.

According to [13], the effectiveness of sunscreen is based on the SPF value with the category of sunscreen protection, namely minimal protection with an SPF value of 2-4, moderate protection with an SPF value of 4-6, extra protection with an SPF value of 6-8, maximum protection with an SPF value of 8-15 and ultra protection with a value of 15.

Hence, the best formula that has the highest SPF value is Formula F3. The higher the concentration of the active substance, the higher the SPF value, making it more effective at protecting the skin from UV exposure. [24]. Compounds that have a function as a sunscreen are flavonoid compounds.

According to Fadlilaturrahmah *et al*. [25], flavonoid compounds are a group of secondary metabolites that have antioxidant properties and play a role in preventing cell damage by free radicals such as UV light, smoke, and pollution [25].

According to Seed *et al*. [26], absorption of UV light by flavonoids will cause changes in the structure of these flavonoids [Figure 1].

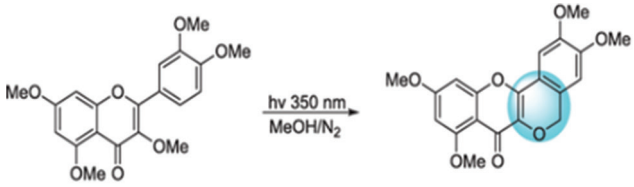

Figure 1: UV absorption by quercetin pentamil ether

The mechanism of flavonoids in protecting the skin from UV exposure is by absorbing UV rays that penetrate the skin. Flavonoids have a structure in the form of conjugated double bonds so that almost all flavonoids can act as chromophore. Flavonoids will absorb UV light and cause electron excitation from the ground state to orbitals with higher energy. In addition, flavonoids are also thought to have anti-inflammatory activity that acts on the arachidonic pathway. Flavonoids can inhibit the expression of COX-2 so that the synthesis of prostaglandins such as PGI2 and PGE2, which play an important role in the pathogenesis of erythema induced by UV light, will be inhibited [26].

Results of physical evaluation of Batang Pulai Bark extract lotion preparations

Organoleptic Test

The organoleptic observations included the shape, color, smell, and consistency of the lotion preparation. This observation aims to determine the factors that affect the physical and chemical changes in lotion preparations are also related to the convenience of using lotion preparations, including attractive colors, easy to use, and not rancid [27].

Table 7: Organoleptic test results of Pulai Bark extract lotion

Parameter	Observation result			
	F_0	F_1	F_2	F_3
Color	Clear white	Pale yellow	Yellow	Dark yellow
Smell	Has no smell	The smell of olive oil	The smell of olive oil	The smell of olive oil
Consistency	Thick	Thick	Thick	Thick

Based on the description in the table above Table 7, it is found that the color parameter in the F0 formula has a clear white color because it is a lotion base that does not add extract. Formula F1 has a pale yellow color to which the extract is added with a concentration of 0.5%. Formula F2 has a yellow color to which extract is added with a concentration of 1%, and Formula 3 has a dark yellow color to which extract is added with a concentration of 2%. Hence, the difference in color produced in the formulas F1, F2, and F3 can be affected by different concentrations. Parameters odor or aroma in formula F0 has no odor. Formula F1, F2, and F3 have a distinctive olive oil smell. This is due to the difference in the concentration of the lower extract with a high concentration of olive oil. The consistency parameter was observed directly, and the four formulas produced the same consistency. This happens because the lotion formula contains a lotion base that functions as a thickening agent or stiffening agent [28].

Spreadability test

The spreadability test aims to see the ability of the lotion preparation to spread when applied to the skin. The dispersion requirement for topical preparations is 5-7 cm which shows a semi-solid consistency which is very comfortable to use. [1]. The results of the dispersion test can be seen in Table 8.

Table 8: Results of spreading the power of Pulai Bark lotion

Formula	Burden	Diameter length (cm)			
		1 replication	2 replication	3 replication	Average
F0	Glass	4	4.4	4.2	4,2
	50 g	4.8	4.9	4.7	4.8
	100 g	4.7	5.1	5	4.9
		Average			4.6
F1 (0.5%)	Glass	3.5	4.6	4.7	4.3
	50 g	4.3	5.3	5.1	4.9
	100 g	4.8	5.3	5	5
		Average			4.7
F2 (1%)	Glass	3.8	4.9	4.5	4.4
	50 g	4.6	5.5	5.2	5.1
	100 g	4.6	5	5.3	5
		Average			4.8
F3 (2%)	Glass	4.2	4.1	4.3	4.2
	50 g	5.3	5.2	5.3	5.3
	100 g	5.2	5.5	5.3	5.3
		Average			5

Based on the results of observations and calculations on the spreadability test, Formula F0, F1, and F2 did not meet the requirements for the spreadability test for lotion preparations because they were under the range of requirements for the

spreadability test for topical preparations. While the F3 formula meets the requirements for the dispersion test. The factor that affects the diameter of the spreadability is the effect of adding the amount of extract used in each of the formulas. This is because the higher the concentration of the added extract, the wider the dispersion value and the better the spreadability of the preparation. Good spreadability. This causes extensive contact between the active substance and the skin so that the absorption of the active substance into the skin takes place quickly or the release of the desired therapeutic effect on the skin will be faster [29].

Homogeneity Test

The homogeneity test was conducted to determine whether the active substance in the lotion was mixed with the lotion base that had been made. Homogeneous preparations will produce good quality because they show the drug ingredient or active substance is evenly dispersed in the base material. If the drug ingredient or is not evenly dispersed in the base material, then the active substance does not achieve the desired therapeutic effect [29]. The homogeneity test image is shown in Figure 2.

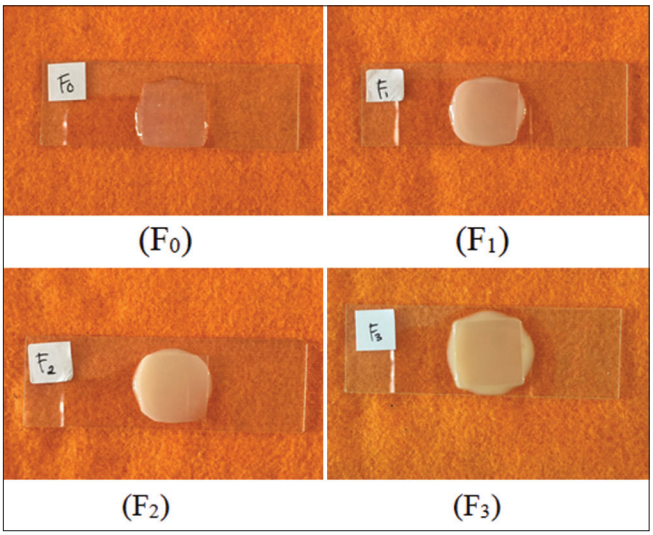

Figure 2: Test for Homogeneity of Lotion Preparations for Batang Pulai Bark Extract

(F_0) (F_1)
(F_2) (F_3)

The four formulas produce a lotion that is semi-solid, pale yellow to dark yellow, and homogeneous, which is characterized by the absence of coarse particles on the surface of the slide and the uniform color of the preparation. This is also due to the characteristics of the sample that there are no coarse, soft granules and when added to the lotion base, the extract is mixed homogeneously.

Stability Test

Stability test was carried out to test whether the preparation was stable during storage. Stability test was carried out to test the preparations were Freeze-Thaw for three cycles. One cycle, which is 48 h, consisting of 24 h at 4°C and 24 h at 40°C, then the lotion preparation was observed to separate or not [30]. The measurement of the height of the phase separation in the third cycle is shown in Table 9.

Table 9: Stability test results for lotion preparations for Batang Pulai Bark extract

Formula	Phase separation height measurement (cm)
F0	No separation occurs
F1	1.2
F2	1.4
F3	1.6

Based on the observations, the stability test evaluation was carried out on the preparation using the Freeze-Thaw method for three cycles, and the phase separation was measured. It was found that the lotion formula F0 (without the active substance) did not separate. In the formulas F1, F2, and F3, separation occurred with different heights of phase separation. This was caused by adding different extract concentrations in the lotion formulas F1, F2, and F3. This is due to the instability of the emulsion, namely creaming, where there is a separation into two parts starting from the movement of droplets caused by oil having a smaller density than water so that the oil droplets will be on the surface of the emulsion and form a separate layer. The droplets experience a higher repulsion force than the attractive force so that the droplets break, and the oil phase will recombine with the oil phase, and the water phase droplets will recombine with the water phase [23], [31].

pH test

The pH test was carried out to find out the lotion that had been made met the pH requirements for topical preparations, which was between 4.5 and 6.5. Topical preparations with a pH value that is too acidic can irritate the skin while being too alkaline can make the skin dry and flaky [29].

Based on the table above Table 10, it can be seen that the Pulai Bark Extract lotion meets the requirements for topical preparations because it does not pass the range for topical preparations, namely 4.5–6.5.

Table 10: pH test results for the lotion formula of Batang Pulai Bark extract

Formula	pH
F0	5,6
F1	5.3
F2	5.2
F3	5.2

Conclusion

The SPF value is affected by the total concentration of pulai bark extract in the lotion, where Formula F0 is a lotion base that is ineffective as a sunscreen since it has a value below the minimum protection value. Formula F1 contains an SPF value of 3.3427, Formula F2 contains an SPF value of 4.7752, Formula F3 contains an SPF value of 5.0978, Formula F4 contains an SPF value of 4.7752, Formula F5 contains an SPF value of 5.0978, Formula F4 contains an SPF value of 4.7752, Formula F5 contains an SPF value of 4.7752, Formula F4 contains an SPF value of 4.7752, Formula F5 contains an SPF value of So, the higher the concentration, the better.

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