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Formulation, Stability, and Activity Test of Sunscreen Cream from Cactus Stem Extract (*Opuntia Cochenillifera (L.)* Mill) Using an Ultraviolet-Visible Spectrophotometer

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Abstract: Sunlight has several health benefits, but it also has certain negative impacts. Sunscreen is a cosmetic product that protects the skin from ultraviolet rays, which can cause a number of skin health problems. Phenolic compounds, particularly flavonoids, have the potential to be used in sunscreen cosmetics. The goal of this research is to develop a sunscreen cream using the active ingredient Centong cactus stem extract (Opuntia cochenillifera (L.) Mill) and evaluate its stability and Sun Protection Factor (SPF) using a spectrophotometer. The results showed that the formulation of Centong cactus stem extract sunscreen cream met the criteria set regarding its physical and chemical properties based on the Indonesian National Standard (SNI) 2016-4399-1996. These properties include organoleptic characteristics, homogeneity, spreadability, adhesion, pH, viscosity, and stability. The sunscreen activity test resulted in an SPF rating of 7.04 ± 0.32 for the first f ormulation (FI) for extra protection, 12.02 ± 0.34 for the second formulation (FII) for maximum protection, and 18.03 ± 0.31 for the third formulation (FIII) for ultra protection. The results of this initial study indicate that Centong cactus stem extract sunscreen cream has good stability and ultra-sun protection factor FIII (15%) activity, which is very good for further research.

Keywords: Cream; Stem cactus centong (Opuntia cochenillifera (L.) Mill); SPF; Sunscreen

Introduction

Tropical countries receive plenty of sunlight throughout the year, which humans require, but too much sun can cause minor skin tissue damage such as erythema, edema, sunburn, tanning, and hyperplasia (Agustin et al., 2024). This damage is produced by sunlight's ultraviolet rays (UVA and UVB) (Rizal et al., 2023). Sunscreen is one of the cosmetic products that can help prevent sun-induced skin tissue damage. As a skincare product, sunscreen comes in a variety of forms, including lotion, gel, cream, liquid, spray, stick, and powder (Agustin et al., 2024). There are two ways that sunscreen protects the skin. Sunscreen absorbs UV rays before they reach the skin, and it also reflects UV rays to prevent them from striking the skin (Fardanu et al., 2026). The criteria of erythema transmission percentage, pigmentation transmission percentage, and Sun Protection Factor (SPF) are commonly used to express sunscreen activity. The spectrophotometric approach can be used to compute these three parameters (Ramdan et al., 2023). SPF is a standardized metric that indicates how well a product protects against UV rays or how long we can spend in the sun without becoming burned. A sunscreen's effectiveness to prevent sunburn increases with its SPF value (Sari et al., 2024).

The use of natural components, such as plant extracts, is becoming more popular in sunscreen production these days since they are less harmful than synthetic or chemical ingredients, safer to use, and easier

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to obtain (Suryadi et al., 2021). Natural components such as rhizomes, fruits, seeds, flowers, leaves, roots, and sap can be used to make natural sunscreen (Dewi & Yowani, 2023). Flavonoids, alkaloids, tannins, saponins, and steroids are among the phenolic chemicals found in plant parts that serve to shield plant tissue from UV radiation damage (Simanjuntak et al., 2026). Plant secondary metabolites can protect the skin from UV radiation by absorbing UV radiation, inhibiting the production of free radicals, and activating the antioxidant system (Marayart et al., 2025). Ultraviolet radiation can be absorbed by flavonoid compounds due to electronic changes that occur in conjugated double bonds (Hidayah et al., 2023). Phenolics have a conjugated structure comparable to photoprotection, which means they can absorb UV-A and UV-B radiation. Phenolics also release hydrogen atoms from their hydroxyl groups, creating radicals that later produce stable phenoxyl radicals, both of which play important roles in their ability to combat radicals (Widiasriani et al., 2024). Tannin compounds function as sunscreens, helping to absorb and suppress UV radiation (hydroxyl radicals) by donating reducible hydrogen atoms, thus providing protection against UV rays (Astryna et al., 2025).

Centong cactus (*Opuntia cochenillifera (L.)* Mill) is a species of cactus that is a member of the genus Opuntia and the family Cactaceae. Flavonoids, alkaloids, tannins, saponins, and steroids are among the active substances found in Centong cactus (Irianto et al., 2022). The centong cactus has been investigated for its antibacterial, water-purifying, and soil-remediation characteristics (Cahyati et al., 2022; Rahmawati et al., 2023; Tampubolon et al., 2022). Based on the secondary metabolite content in the Centong cactus stem and the fact that there has never been any research on sunscreen cream using Centong cactus stem extract, it is necessary to conduct research on the formulation of sunscreen cream using Centong cactus stem extract. This study aims to develop a sunscreen cream formulation using Centong cactus stem extract. The sunscreen cream containing the active ingredient Centong cactus stem extract was tested for stability and potential SPF value using the UV-Vis spectrophotometry method. Spectrophotometric techniques are used to determine sunscreen activity because they have excellent sensitivity, specificity, and quantitativeness while also being quick and easy to use (Yang et al., 2018).

Methods

Centong cactus stems used in this study were collected from Sukarame District, Bandar Lampung City, Indonesia, with the following criteria: fresh, without scars, and no history of fruit production. 2 kg of fresh Centong cactus stems washed, drained, and cut into small pieces for drying. The material dried in an oven for 24 hours at a temperature of 50°C and a relative humidity of 40% (w/v) until the water content was between 10% and 20% (w/w) (Handoyo & Pranoto, 2020). All chemicals for analysis, including 70% (v/v) ethanol, 38% (v/v) concentrated hydrochloric acid, 96% (v/v) concentrated sulfuric acid, 100% (v/v) glacial acetic acid, magnesium powder, and ferric chloride, were pre-analyzed by Merck and acquired from PT. Anugrah Putra Kencana in Bekasi, West Java, Indonesia. The cream's basic ingredients (stearic acid, cetyl alcohol, glycerin, triethanolamine, methylparaben, propylparaben, and lanolin) were acquired from PT Azza Mulia Chemicals in Bogor.

Extraction of Centong cactus stems

About 600 grams of dried Centong cactus stems were ground into a fine powder. Extraction was carried out using the maceration method with 70% (v/v) ethanol as a solvent. The ratio of fine Centong cactus stem powder to 70% (v/v) ethanol was 1:3 (v/v) at room temperature for 24 hours. The extraction results were filtered using Whatman No. 1 filter paper. The macerate was evaporated using a rotary evaporator (Heidolph Hei-VAP Rotary Evaporator) until a thick extract was obtained (Handoyo & Pranoto, 2020; Utami et al., 2017).

Phytochemical analysis of centong cactus stem extract

Test for alkaloids

2 ml of the solution of the extract and 0.2 ml of dilute hydrochloric acid were taken in a test tube. Then 1 ml of Dragendorff's reagent was added. An orange-brown precipitate was formed, and that was indicated as the presence of alkaloids (Yana et al., 2022).

Test for flavonoids

A total of 2 mL of extract was combined with 5 mL of boiling water, heated for 5 minutes, and filtered using Whatman paper No.1. 5 mL of filtrate was mixed with 0.1 mg of Mg powder and 1 mL of concentrated hydrochloric acid and forcefully shaken. The presence of flavonoids in a red, yellow, or orange tint indicates a positive result (H. Novitasari et al., 2021).

Test for saponins

A test tube was filled with 3 mL of Centong cactus stem extract, followed by 10 mL of hot distilled water and cooling. After shaking vigorously for 10 seconds, 1 drop of hydrochloric acid (2 N) was added. A positive saponin test was indicated by the creation of a stable foam 1-10 cm high lasting at least 10 minutes (A. Novitasari, 2016).

Test for tannins

5 mL of Centong cactus stem extract solution was placed in a test tube. Then, 1 mL of 5% (w/v) ferric chloride solution was added. A blackish-green precipitate formed, indicating the presence of tannins (Sulistyarini et al., 2020).

Test for steroids and triterpenoids

2 mL of Centong cactus stem extract is added with 10 drops of glacial acetic acid and 2 drops of concentrated sulfuric acid. The solution is gently shaken and allowed to stand for several minutes. Steroids are indicated by a blue or green color, while triterpenoids produce a red or purple color (Pujiastuti & Islamiyati, 2021).

Sunscreen cream formulation

The components for sunscreen cream include centong cactus stem extract, stearic acid, cetyl alcohol, glycerin, triethanolamine, methylparaben, propylparaben, lanolin, and distilled water, as shown in Table 1.

Table 1. Sunscreen cream component percentage (w/w) per 100 g

Material	FI	FII	FIII	Uses
Centong Cactus Stem Extract	5	10	15	Active Ingredients
Stearic Acid	8	8	8	Emulsifier
Cetyl Alcohol	2	2	2	Thickener
Glycerin	10	10	10	Humectant
Triethanolamine	1	1	1	Emulsifier
Methylparaben	0.02	0.02	0.02	Preservative
Propylparaben	0.2	0.2	0.2	Preservative
Lanolin	1	1	1	Emollient
Distilled water	100	100	100	Solvent

Sunscreen cream with cactus stem extract is made by combining oil and water phase components. The oil phase consists of fat-soluble components, namely cetyl alcohol, lanolin, and stearic acid, which are melted in a water bath until they reach a temperature of 70°C, after which propylparaben is added. The water phase, which consists of water-soluble components, namely glycerin, triethanolamine, and distilled water, is heated in a water bath to a temperature of 70°C, after which methylparaben is added. Both phases are mixed in a mortar and ground until a cream base is formed. The cactus stem extract dissolved in glycerin with a ratio of 1:3 (w/v) is added to the mortar containing the cream base and processed until homogeneous (Agustin et al., 2024).

Evaluation of cream formulation

The cream formulation was evaluated based on its organoleptic qualities, homogeneity, pH, viscosity, spreadability, adhesiveness, and stability; each evaluation was conducted three times (Puspitasari et al., 2018).

Test for homogeneity

Homogeneity testing involved spreading the cream on a glass slide, covering it with another glass slide, and then determining if the base on the slide was homogenous and the surface smooth and even (Puspitasari et al., 2018).

Test for pH

0.5 g of each sunscreen cream formulation was dissolved in 10 mL of distilled water, and the pH was determined using a pH meter (Jenway 3510) (Puspitasari et al., 2018).

Test for viscosity

Viscosity testing was carried out by placing 0.5 g of the sunscreen cream formulation into a glass container and measuring its viscosity with a rotor-based viscometer (Ndj5-S) (Lumantow et al., 2023).

Test for spreadability

Spreadability was measured using a transparent glass sheet covered with millimeter paper. 0.5 g of cream was poured onto the glass, which was then covered with another transparent glass sheet and left for 1 minute to determine the spread diameter. Next, weights of 50, 100, and 150 g were sequentially added to the transparent glass, and the resulting spread diameter was measured. (Lumantow et al., 2023).

Test for adhesiveness

A 0.5 g dose of sunscreen cream was placed on one glass plate and covered with another. The two plates were fused together and pushed with a 500 g weight for 5 minutes. Replace the 500 g weight on the glass plate with an 80 g weight. Pull the lever to release the two glass plates, then record the time they were released. (Tungadi et al., 2023).

The cream's organoleptic properties, homogeneity, pH, viscosity, spreadability, and adhesiveness were evaluated in comparison to the requirements for sunscreen cream specified in the Indonesian National Standard (INS) 2016-4399-1996 (Puspitasari et al., 2018).

Test for stability

The cream's stability was tested utilizing a heating-cooling cycle. The samples were held at 4°C for 24 hours before being heated to 40°C for the same amount of time (one cycle). The cream formulation's stability was evaluated over three 48-hour periods (Saryanti et al., 2019). The stability tests of pH, viscosity, spreadability, adhesiveness, and Sun Protection Factor (SPF) of F1

(5%), FII (10%), and FIII (15%) were performed five times each. The stability test data was examined using one-way ANOVA to identify significant variations in average values related to heat-cold storage between formulations (Saryanti et al., 2019).

SPF Value Test

In a 100 ml volumetric flask containing pro-analytical ethanol, 0.4 g of each sunscreen cream formulation comprising Centong cactus stem extract FI (5%), FII (10%), and FIII (15%) was ultrasonically filtered for 5 minutes before being filtered with filter paper. The negative control F0 (cream base devoid of extract or ethanol) underwent the same treatment. A UV-Vis spectrophotometer was used to determine the SPF. The SPF value was calculated by measuring the cream formulation's absorbance at 290-320 nm with a UV-Vis spectrophotometer at 5 nm increments (Singh & Sharma, 2016). For each sample and negative control, repeat three times. The SPF value is derived using Mansur's mathematical equation, which is as follows:

$$SPF = CF \times \sum_{290}^{320} EE\ (\lambda) \times I\ (\lambda) \times Abs\ (\lambda) \quad (1)$$

CF stands for correction factor (=10), EE for erythema effects, I for sun intensity, Abs for absorbance, and λ for wavelength. Multiplying EE and I yields a constant, as seen in Table 2.

Table 2. Value of EE x I (Puspitasari et al., 2018)

Wavelength (λ nm)	EE x I
290	0.0150
295	0.0817
300	0.2874
305	0.3278
310	0.1864
315	0.0839
320	0.0180

The effectiveness of a sunscreen formulation is measured by calculating its SPF value. According to the Food and Drug Administration (FDA), SPF is divided into five levels of sunscreen protection. The effective SPF values are 2-4 (minimum protection), 4-6 (medium protection), 6-8 (extra protection), 8-15 (maximum protection), and more than 15 (ultra protection) (Zulkarnain et al., 2024).

Results and Discussion

For every 7.5 kg of Centong cactus stems, 600 g of dried stems are produced. The samples were dried using a black cloth to prevent direct sunlight from damaging or decreasing the active chemicals found in Centong cactus stems (Tari & Indriani, 2023). Maceration of dried Centong cactus stems produced 116 g of thick extract with a yield of 19.33% (w/w). This is a good result because the yield is larger than 10% (w/w) with a water content of 21% (w/w), whereas the typical water content of thick extracts ranges between 5% and 30% (w/w) (Widodo et al., 2024). The maceration process is used to produce extracts because it is simple and can extract thermolabile compounds without requiring heat (Dwiastuti & ARDIYATI, 2021).

Phytochemical test results

To investigate the compounds present in Centong cactus stem extract, their chemical composition was determined. Chemical content was determined qualitatively using reactions with reagents or other substances. Table 3 shows the results of identifying the chemical composition of secondary metabolite compounds.

Table 3. Phytochemical test results

Secondary Metabolites	Reagents	Results	Observations
Alkaloid	*Dragendorff*	+	orange-brown precipitate
Flavonoid	Mg and hydrochloric acid	+	Yellow
Saponin	Distilled water and hydrochloric acid	+	Foam stable for 10 seconds
Tanin	ferric chloride	+	Blackish green
Steroid	sulfuric acid	+	Green
Triterpenoid	sulfuric acid	-	No red

Based on the research results in Table 3, qualitative testing of the extract from Centong cactus stems shows that the types of secondary metabolites are alkaloids, flavonoids, saponins, tannins, and steroids. Flavonoids found in Centong cactus stems are flavones, especially quercetin and rutin (Amrane-Abider et al., 2023). These two compounds contain five and ten hydroxyl groups, respectively, as well as chromophore groups that can absorb UV rays and reduce their intensity on the skin (Parawansya et al., 2024). Quercetin and rutin convert most of the UV energy into heat energy that is not harmful to the skin (Zulkarnain et al., 2024). This mechanism then inhibits or minimizes the appearance of erythema caused by UV exposure (Amini et al., 2020). Based on the findings of the qualitative analysis of the chemical composition of Centong cactus extract, this indicates that this cactus can be used as a natural component in the production of sunscreen.

Evaluation Results of Tabir Cream Formulation

Results of organoleptic and homogeneity test

The organoleptic and homogeneity test findings were visually inspected. Table 4 and figure 1 shows the results of organoleptic and homogeneity tests on sunscreen cream using Centong cactus stem extract.

Table 4. Organoleptis and homogeneity results.

Formulation	Color	Shape	Aroma
I (5%)	Light brown	Semi-solid and homogeneous	Typical weak
II (10%)	Brown	Semi-solid and homogeneous	Typical
III (15%)	Dark brown	Semi-solid and homogeneous	Very typical

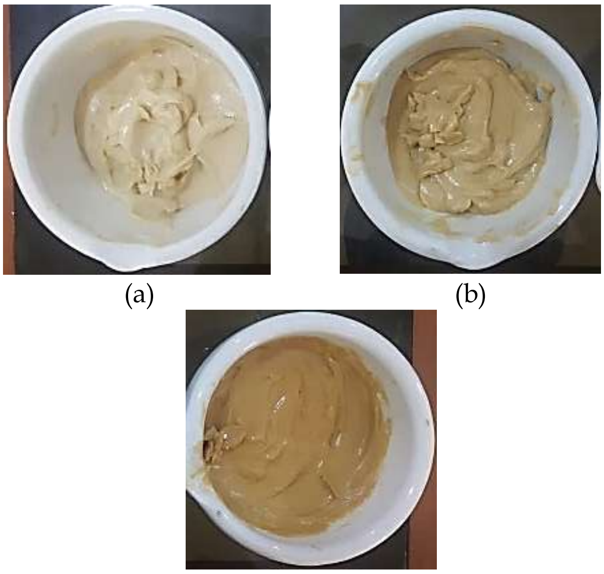

Figure 1. Sunscreen cream from Centong cactus stem extract, (a) FI (5%), (b) FII (10%), and (c) FIII **(15%).**

The color and aroma changes amongst formulations are caused by differences in the concentration of the active ingredient content of Centong cactus extract, whereas the same semi-solid form is caused by all recipes having the same cream base concentration. The homogeneity test of the Centong cactus stem extract sunscreen cream produced all homogeneous formulas that met the norms, i.e., there were no particle grains or lumps. A homogeneity test was performed to determine whether the cream formulation included coarse particles or lumps. The color distribution, regular blending of cream components, and lack of coarse particles all indicate a homogeneous cream formulation (Pratikto et al., 2024). The homogeneity test revealed that all sunscreen cream formulations containing Centong cactus stem extract were homogenous, meeting the criteria of the Indonesian National Standard (INS) 2016-4399-1996, which mandates that topical formulations must be homogeneous (Inaku et al., 2023).

The cream is made up of two phases: oil and water. The oil phase is made up of fatty components such as cetyl alcohol, lanolin, and stearic acid that are melted at 70°C before being combined with propylparaben. The addition of propylparaben after all oil phases have melted is intended to optimize the amount of propylparaben blended uniformly in the melted oil phase due to heating (Erwiyani et al., 2021). Glycerin, triethanolamine, and distilled water are heated to 70°C before adding methylparaben. The use of methylparaben and propylparaben in cream formulations helps avoid microbial contamination due to the highwater content of the formulation (Lumantow et al., 2023).

Results of pH, viscosity, spreadability tests, and adhesiveness

The results of the pH, viscosity, and spreadability and adhesiveness tests of the Centong cactus stem extract sunscreen cream preparation can be seen in Table 5.

Table 5. The results of the pH, viscosity, spreadability, and adhesiveness tests.

Formulation	pH		viscosity (cP)		spreadability (cm)		Adhesiveness (seconds)	
	Results	INS	Results	INS	Results	INS	Results	INS
I (5%)	5.91±0.23		4586±0.15		6.78±0.32	5 - 7	3.97±0.27	
II (10%)	5.78±0.25	4.5-6.5	4920±0.25	2000-	6.52±0.29		4.32±0.25	2-300
III (15%)	5.71±0.24		5255±0.33	50000	6.31±0.30		4.95±0.29	

Indonesian National Standard (INS) 2016-4399-1996

The pH test was used to determine how closely the cream formulation matched the Indonesian National Standards (INS 2016-4399-1996). The pH test results indicate that the formulation meets the INS 2016-4399-1996 for cream formulations, which require a pH level that aligns with the normal skin pH range of 4.5 to 6.5 (Inaku et al., 2023). A composition with an acidic pH will produce skin irritation, while an alkaline pH may cause dry skin (Puspitasari et al., 2018). A formulation's thickness is determined through viscosity testing. The viscosity of a good cream is indicated by a formulation that is neither too runny nor too thick (Lumantow et al., 2023). Based on the test results, the increase in viscosity of formulations I (5%), II (10%), and III (15%) was caused by the increasing concentration of the active substance of Centong cactus extract. The three cream formulations still meet the Indonesian National Standards (INS) standard viscosity, which is between 2,000 cp and 50,000 cp (Suradnyana et al., 2023). The spreadability test of Centong cactus stem extract sunscreen cream was developed to establish if the cream formulation's spreadability passes the Indonesian National Standard of 5–87 cm. The spreadability test was performed to measure the ability of the sunscreen cream formulation to spread when applied to the skin; the higher the spreadability, the more evenly the active component will be disseminated (NurKhotimah et al., 2024). The spreadability test findings revealed a reduction as the concentration of the active component extract increased, indicating an increase in viscosity. The spreadability of a cream formulation is inversely related to its viscosity (Puspitasari et al., 2018). The adhesiveness test of sunscreen cream employing Centong cactus stem extract in Formulations I, II, and III gave results of 3.97, 4.32, and 4.95 seconds. The results remain within the Indonesian National Standard of 2-300 seconds (Pratikto et al., 2024). The adhesiveness test determines how well the cream formulation adheres to the skin when applied, allowing the active material to be absorbed equally (Parawansya et al., 2024). Because the active material can be absorbed maximally, a cream formulation with a high adhesiveness will stick to the skin for a longer period of time and be more effective. High adhesiveness will seal the pores, and if it is too little, the effect will be negligible (NurKhotimah et al., 2024).

Results of Cream Formulation Stability Test

The stability test of the sunscreen formulation was performed to assess the cream formulation's resilience to temperature variations during storage (Zulkarnain et al., 2024). The observation results from the heating-cooling cycle test revealed no changes in the color, scent, texture, homogeneity, pH, viscosity, spreadability, adhesiveness, and SPF of the sunscreen cream formulation. Figure 2 shows the results of the stability test of the sunscreen cream formulation with Centong cactus stem extract throughout three cycles.

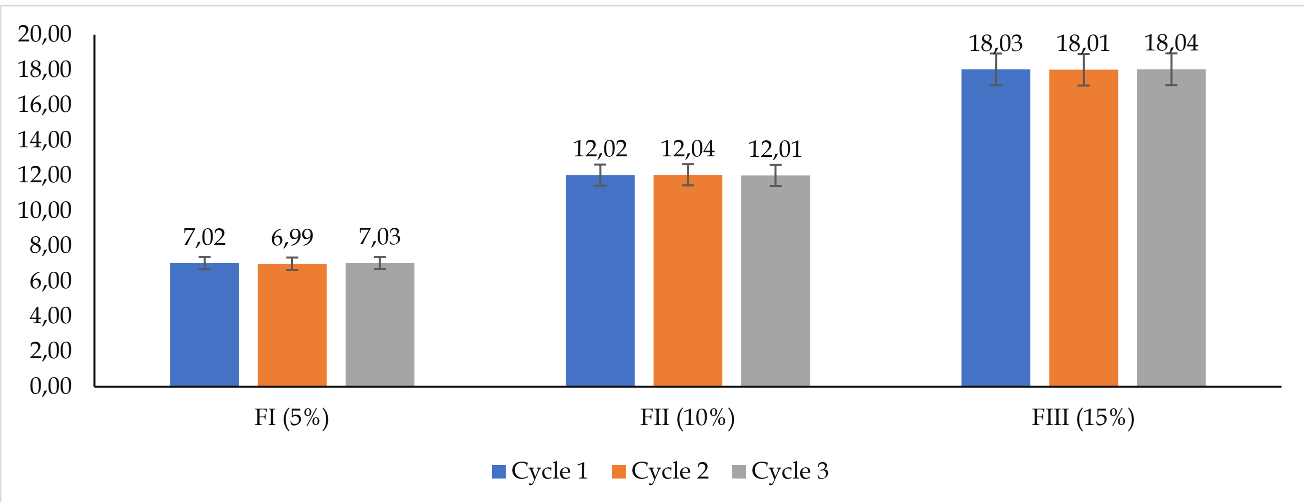

Figure 2. Results of three cycle stability tests of the cream formulation

The stability study of pH, viscosity, spreadability, adhesiveness, and SPF values using one-way ANOVA yielded significant values of 0.670, 0.595, 0.735, 0.821, and 0.929. Results indicate no significant variation in response stability test data for pH, viscosity, spreadability, adhesion, and SPF values during the test cycle (p-value > 0.05). It is possible to infer that the sunscreen cream formulation of cactus stem extracts FI (5%), FII (10%), and FIII (15%) is stable during storage. (Suradnyana et al., 2023).

SPF Value Test Results

The Sun Protection Factor (SPF) of sunscreen cream formulations containing extract from the Centong cactus stem was determined in vitro using a UV-Vis Spectrophotometer (Shimadzu). The SPF calculation results were based on absorbance measurements for each formulation, which were then entered into Mansur's mathematical equation (Inaku et al., 2023). The calculation results obtained were cream formulation and negative control can be seen in Table 6 below (Widodo et al., 2024).

Table 6. Results of SPF value

Cream formulations	SPF Value	Sunscreen Protection Category
F0 (Negative control)	2.06 ± 0.16	Minimum protection
FI (5%)	7.04 ± 0.32	Extra Protection
FII (10%)	12.02 ± 0.34	Maximum Protection
FIII (15%)	18.03 ± 0.31	Ultra Protection

The test findings showed that the average SPF at F0 (negative control), F1 (5%), F2 (10%), and F3 (15%) was 2.06 ± 0.16, 7.04 ± 0.32, 12.02 ± 0.34, and 18.03 ± 0.31, respectively. The results of the Shapiro-Wilk normality test revealed that F0 (negative control) cream had a Sig. value of 0.389, F1 cream had a Sig. value of 0.710, F2 cream had a Sig. value of 0.233, and F3 cream had a Sig. value of 0.600. If the data has a Sig. value greater than 0.05, it may be stated that the SPF value of the cream is regularly distributed. The Levene homogeneity test findings yielded a Sig. value of 0.095. If the Sig. value is more than 0.05, the data variance for the cream SPF value is the same or homogenous, and the One-Way ANOVA test can be repeated. The findings of the one-way ANOVA analysis yielded a Sig value of 0.000, showing a significant difference in each average SPF value of the cream formulation. Because of the substantial difference in average SPF value, the Tukey post-hoc test may be used. The Tukey post-hoc analysis revealed significant differences among creams F0 (negative control), F1 (5%), F2 (10%), and F3 (15%) (Sig, <0.05). This demonstrates that increasing the content of Centong cactus stem extract in the cream formulation as a sunscreen has a substantial impact.

The Sun Protection Factor (SPF) value determines how well a sunscreen lotion protects the skin from UVB radiation (UV type B rays), which can cause skin burns. If sunscreen is not used, the skin can only survive sun exposure for 10 minutes before becoming red and blistering. The SPF value multiplied by ten minutes indicates how long the sunscreen will protect the skin. The formula III investigation, with an SPF value of 18, found that the sunscreen can protect the skin from UV rays for 180 minutes, or 3 hours, preventing burning and redness (Rahman et al., 2025). The probable chemical component operating as a sunscreen or active element in the cactus stem extract, which is used in sunscreen cream, is a phenolic substance called flavonoids. Flavonoids' capacity to act as sunscreen is attributed to the existence of conjugated double bonds in flavonoid compounds, which create an electron transfer and allow the molecule to absorb radiation in the UV range (Anggreini et al., 2024).

Conclusion

Centong cactus stem extract (Opuntia cochenillifera (L.) Mill) has activity as an active ingredient in sunscreen formulations, especially the FIII (15%) formulation, which shows ultra protection. All Centong cactus stem extract formulations meet the Indonesian National Standard (INS) 2016-4399-1996 for organoleptic properties, homogeneity, spreadability, pH, viscosity, adhesion, and stability. Creams with 5%, 10%, and 15% Centong cactus stem extract provide SPF values of 7.04 ± 0.32, 12.02 ± 0.34, and 18.03 ± 0.31, respectively, which indicate extra, maximum, and ultra protection. The spectrophotometric method has been proven to be very specific, sensitive, and fast in determining the activity of sunscreen creams.

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Authors Contribution

All Author contributed for each stage of research.

Conflicts of interest

The authors of this manuscript declare that they have no financial or non-financial interest in any organization or entity (such as honoraria; educational grants; participation in speakers' bureaus; memberships, employment, consultancies, stock ownership or other equity interests; and expert testimony or patent licensing arrangements) or personal or professional relationships, affiliations, knowledge, or beliefs.

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