IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

# Research on Formulation and Evaluation of Synthetic Sunscreen Cream

**Saniya B. Mulani[1], Dnyaneshwari M. Patil[2], Sanika S. Mahajan[3], Vinayak Kale[4]**
[4]Assistant Professor, Department of Quality Assurance
[1,2,3] Students, JBVP'S Vidya Niketan Collage of Pharmacy, Lakhewadi, Indapur, Pune, Maharashtra, India

**Abstract:** *Synthetic sunscreens are widely used photoprotective products designed to shield human skin from the harmful effects of ultraviolet (UV) radiation emitted by the sun. These formulations primarily contain organic chemical compounds which absorb, scatter, or reflect UVA and UVB rays to prevent skin damage, premature aging, sunburn, and skin cancer. The increasing exposure to solar radiation and rising awareness regarding skin health have significantly contributed to the global demand for effective sunscreen products. Synthetic sunscreens offer advantages including ease of application, cosmetic elegance, water resistance, and broad-spectrum protection. However, concerns have emerged regarding their potential environmental impact, particularly on marine ecosystems such as coral reefs, as well as possible health risks related to skin absorption and hormonal disruption. Recent research focuses on improving sunscreen efficacy, photostability, safety, and environmental sustainability through advanced formulations and the development of alternative UV filters. This abstract highlights the composition, mechanism of action, benefits, limitations, and future prospects of synthetic sunscreens in modern skincare and dermatological protection.*

**Keywords:** Sunscreen, Sun Protection Factor, Ultraviolet Radiation, Photoprotection, Zinc Oxide, UV Spectrophotometry, Mansur Method, Emulsion

## I. INTRODUCTION

Sunscreens are made up of both active ingredients (UV filters) and inactive components, and they are available in various forms such as Cream, lotions, sprays, and roll-ons. Their effectiveness depends on how these ingredients are combined. Key factors influencing sunscreen performance include SPF (sun protection factor), broad-spectrum protection, photostability, substantivity, and overall cosmetic acceptability. These factors determine how UV filters are selected and used in commercially available sunscreen formulations.(1) Sun damage can be reduced by following appropriate protective measures. According to the World Health Organization (WHO), the most effective protection is achieved by combining clothing, shade, sunglasses, and hats with the use of sunscreen applied to exposed areas of the body. Regular daily use of sunscreen helps lower the risk of skin cancer and delays premature aging of the skin. People have different skin tones, and their sensitivity to ultraviolet (UV) radiation varies accordingly. Individuals with darker skin generally have greater resistance to sunburn and higher tolerance to UV exposure. However, they are still vulnerable to UV-related skin damage. In such cases, early detection of skin cancer can be difficult because signs like sunburn or tanning are less noticeable. Solar radiation consists of multiple forms of energy, including infrared (IR), visible light, and ultraviolet (UV) radiation. These forms are part of the electromagnetic spectrum, which extends approximately from 100 nm to 1 mm. Among them, infrared radiation has the longest wavelength range (0.7 µm to 1000 µm), followed by visible light (380–700 nm), while ultraviolet radiation has the shortest wavelengths (10–400 nm). Due to its shorter wavelength and higher energy, UV radiation is considered the most biologically harmful component. Ultraviolet radiation is further classified into three categories: UVA, UVB, and UVC. UVA rays have the longest wavelength (320–400 nm) and lowest energy among UV types, making them comparatively less damaging but still capable of causing skin aging and pigmentation. UVB rays fall within the range of 290–320 nm and possess moderate energy, contributing significantly to sunburn and skin inflammation. UVC rays, with wavelengths between

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 9, May 2026 Impact Factor: 8.2

100–280 nm, have the highest energy and greatest potential for biological damage; however, they are almost entirely absorbed by the ozone layer and do not reach the Earth's surface. The Earth's atmosphere plays a critical protective role by completely filtering out UVC radiation and partially absorbing UVB. As a result, approximately 95% of the UV radiation reaching the Earth is UVA, while only about 5% is UVB. Despite this, both UVA and UVB are capable of inducing DNA damage in skin cells. UVA primarily contributes to photoaging and tanning, whereas UVB penetrates the skin more effectively and is mainly responsible for erythema (sunburn). Exposure to UV radiation also promotes the formation of reactive oxygen species (ROS), which can trigger oxidative stress, photochemical reactions, and photosensitization of the skin. The body naturally defends against such damage through melanin, a pigment that acts as an antioxidant by absorbing UV radiation and neutralizing free radicals. Chronic exposure to UV radiation can lead to severe health issues, including eye disorders and skin cancers. Skin cancers are generally classified into malignant melanoma, which has a high mortality rate, and non-melanoma types such as basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), which are more common. In addition to UV radiation, both infrared radiation and visible light can adversely affect the skin by altering the structure of the stratum corneum and degrading components of the dermal matrix.[2] Nevertheless, sunlight also offers certain health benefits, including the synthesis of vitamin D, improved cardiovascular function through nitric oxide-mediated vasodilation, and antimicrobial effects. Sunscreens are formulations that help shield the skin from the harmful effects of ultraviolet (UV) radiation present in sunlight. They reduce skin damage such as premature aging, including wrinkles, sagging, and other UV-induced changes.

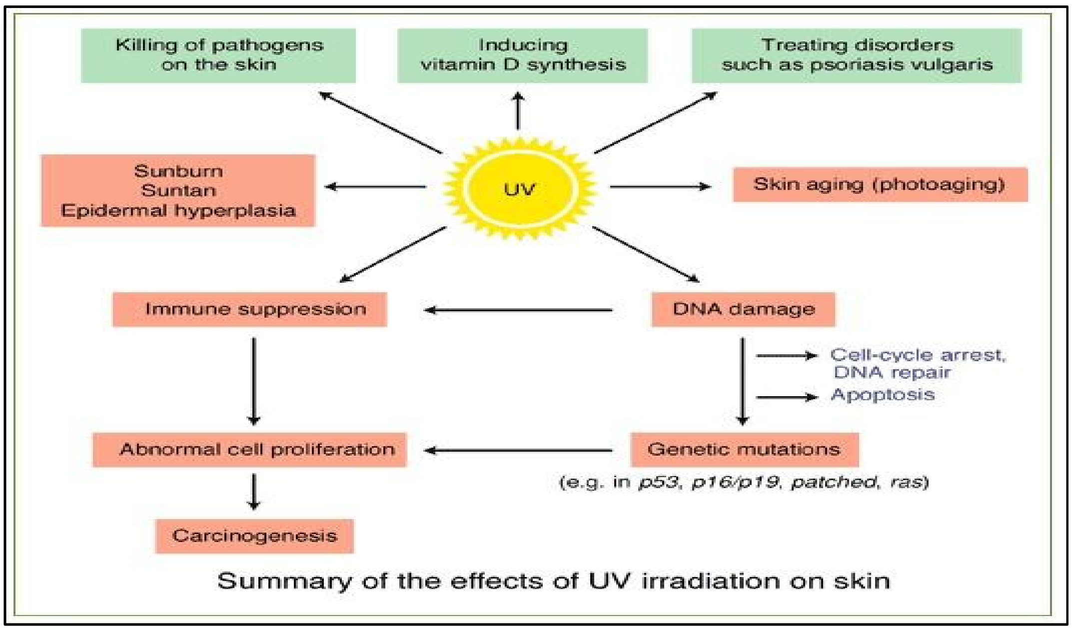



**Figure 1 : Effect of UV radiation on human skin layer**

Their main role is to prevent sunburn, and their effectiveness is usually measured by the Sun Protection Factor (SPF). Sunscreens are essential in protecting the skin from the harmful effects of ultraviolet (UV) radiation. UVB rays primarily affect the outermost layer of the skin, leading to sunburn and surface damage. The use of sunscreen agents helps prevent and manage such skin damage. When these photoprotective products are applied regularly, either for treatment or prevention, they not only reduce existing symptoms but also help in minimizing the recurrence of skin-related disorders, highlighting the importance of their consistent use. Although sunlight offers several health benefits, excessive exposure can be harmful. Studies have shown that both natural and artificial sunlight can cause damage to the mitochondria of human skin cells. Research conducted under laboratory and real-life conditions indicates that UV-visible radiation, particularly in the wavelength range of 385–405 nm, can significantly harm skin cells and lead to the

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

formation of DNA lesions such as cyclobutene pyrimidine dimers. Additionally, UV radiation contributes directly to genetic mutations associated with melanoma and the activation of oncogenes. It may also indirectly promote cancer development by altering the surrounding cellular environment, as observed in experimental animal studies. These findings emphasize the critical need to protect the skin from direct UV exposure. In India, sunscreens fall under the category of

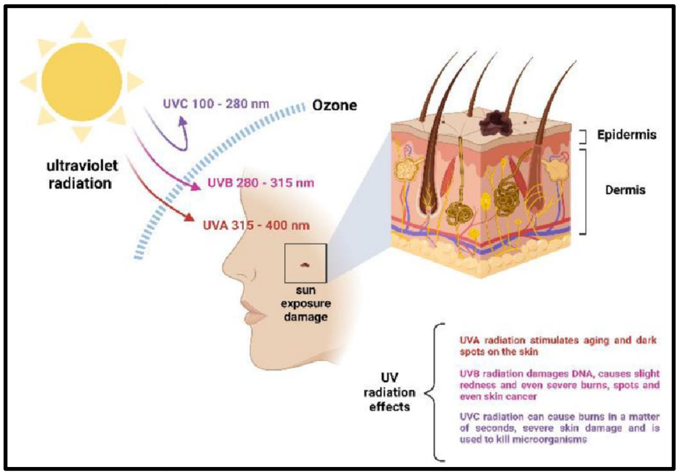



**Figure 2 : Types of UV radiation along with their penetration power into the skin and associated diseases**

cosmetic products regulated by the Drugs and Cosmetics Act, 1940, and the Drugs and Cosmetics Rules, 1945. Product standards are established by the Bureau of Indian Standards (BIS), especially for those listed under Schedule "S" of the rules.(3) The sun's extra-terrestrial radiation comprises a broad spectrum of electromagnetic energy, including X-rays, ultraviolet (UV) radiation, visible light, infrared (IR) radiation, microwaves, and radio waves. The sun's energy reaches Earth with wavelengths between 290-3000 nm. UV radiation (100-400 nm) is divided into UVA (320-400 nm), UVB (290-320 nm), and UVC (200-290 nm). The Earth's surface gets mostly UVA (95-98%) and some UVB (2-5%), as UVC is absorbed by the ozone layer. UVB is absorbed by the skin's outer layer, while UVA penetrates deeper, up to the dermis. UV radiation affects skin in many ways, causing both short-term and long-term damage. Short-term effects include sunburn, pigmentation, and vitamin D production, while long-term effects lead to skin aging and cancer. These effects depend on the type, intensity, and accumulation of UV exposure. The full impact of UV radiation on skin is still being understood, and different effects have varying thresholds, so protecting against one issue doesn't guarantee protection against others. However, the solar spectrum that reaches the Earth's surface is filtered to wavelengths between 290 and 3000 nano meters, encompassing parts of the UV, visible, and IR regions.(4) Sunscreen is a chemical preparation designed to shield the skin from ultraviolet (UV) radiation. While UV rays cause sunburn, UVA rays can be even more damaging to the skin, so an effective sunblock should ideally protect against both types of wavelengths. Regular use of sunscreen helps reduce the development of actinic keratosis, melanoma, and squamous cell carcinoma. Sunscreens may contain either organic or inorganic chemical agents and are often referred to as sunblock creams. These products work by absorbing or reflecting solar energy to safeguard the skin. Increasing rates of skin cancer and the harmful effects of UV-induced photo damage have contributed to the growing use of sunscreen products, which have shown beneficial effects in reducing symptoms. To be effective, sunscreen ingredients should be non-toxic, non-irritating, chemically stable, photo stable, and capable of providing comprehensive protection against solar radiation.(5) Sunscreens are applied to the skin to protect it from the damaging effects of ultraviolet (UV) radiation. They act by either reflecting, scattering, or absorbing UV rays, particularly UV-A and UV-B, which are linked to skin aging, sunburn, and an increased risk of skin cancer. Consistent use of sunscreen plays an important role in preventing early signs of aging and lowering the chances of various skin disorders caused by UV exposure. UV radiation is generally categorized into three types based on wavelength: UV-A (320–400 nm), UV-B (290–320 nm), and UV-C (100–290 nm). UV-C radiation is largely blocked by the Earth's atmosphere and does not reach the skin. However, both UV-A and UV-B penetrate the atmosphere and affect the skin in different ways. UV-A rays penetrate deeper into the skin layers, leading to long-term effects such as premature aging and DNA damage. In contrast, UV-B rays primarily affect the outer layers of the skin and are responsible for immediate effects like sunburn and skin irritation. To provide protection against these harmful rays, sunscreens contain active ingredients classified as either physical (mineral) blockers or chemical absorbers. Physical blockers, such as zinc oxide and titanium dioxide, form a protective layer on the skin's surface that reflects UV radiation. Chemical absorbers, on the other hand, work by absorbing UV energy and converting it into a less harmful form, typically heat. Many modern formulations combine both types of ingredients to offer broad-spectrum protection. The effectiveness of sunscreen is commonly expressed using the Sun Protection Factor (SPF), which measures its ability to protect the skin from UV-B radiation. Higher SPF values indicate a greater level of protection against sunburn and related damage.(6) Ultraviolet radiation (UVR) from the sun can harm the skin in multiple ways. Short-term exposure may lead to sunburn and redness, while prolonged exposure contributes to premature aging, wrinkles, uneven pigmentation, DNA damage, and an increased risk of skin cancer. Sunscreens play an important role in reducing these effects by absorbing, reflecting, or blocking harmful rays. UV radiation is categorized into three types based on wavelength: UV-A, UV-B, and UV-C. When the skin is exposed to these rays, it produces reactive oxygen species (ROS), which can damage DNA, proteins, and lipids. This oxidative stress interferes with the skin's normal functions, accelerating photoaging and raising the likelihood of cancer development. Most sunscreens contain active ingredients that are either organic or inorganic synthetic filters. However, these synthetic compounds may sometimes cause unwanted side effects. As a result, researchers have been exploring natural alternatives. Plant-derived substances can provide sun protection while also offering additional benefits such as soothing, repairing, and nourishing the skin. Despite their advantages, sunscreens are not without limitations. They may cause photoallergic reactions in some individuals, contribute to environmental concerns, and potentially reduce the body's ability to produce vitamin D. Therefore, selecting well-formulated herbal or natural sunscreens can be a useful approach to enhance protection while minimizing some of the drawbacks associated with synthetic products.(7) Plant-derived compounds such as polyphenols, flavonoids, tannins, carotenoids, anthocyanins, vitamins, fixed oils, and essential (volatile) oils obtained from plants, fruits, algae, and lichens provide several benefits compared to synthetic sunscreen ingredients. In addition to shielding the skin from UV radiation, these substances possess strong antioxidant properties that help neutralize free radicals and reduce long-term cellular damage. Many of them also offer added skin benefits, including hydration and cooling effects (as seen with aloe vera), antimicrobial activity from essential oils, and anti-inflammatory, wound-healing, anti-aging, and even anticancer properties. Since damage caused by sunlight involves multiple biological processes, effective protection requires more than simple UV blocking. Natural compounds are therefore well-suited for use in sunscreen formulations because they provide a broader range of protective actions. Modern consumers increasingly prefer multifunctional products that are safe, non-irritating, and environmentally friendly, while also being water- and sweat-resistant. Sunlight plays a vital role in sustaining life and providing energy; however, prolonged exposure can pose significant risks to both the skin and the immune system. In addition to causing sunburn, ultraviolet (UV) radiation is associated with several adverse effects, including hyperpigmentation, premature wrinkling, dermatitis, urticaria, photoaging, immunosuppression, and various types of skin cancer. Although physical protective measures such as sun-protective clothing and sunglasses can reduce exposure, they may be inconvenient and do not always provide complete coverage. Consequently, sunscreen has become one of the most commonly used and effective methods of photoprotection worldwide. This article offers a comprehensive review of sunscreens by discussing their major categories, classification methods, and regulatory standards followed in different regions. It further explains commonly used terminology, methods for evaluation and testing, labeling guidelines, recommended application techniques and dosage, as well as ongoing debates and challenges in the field. In addition, the review explores naturally sourced UV-protective agents, including phenolic compounds such as tannins and flavonoids, carotenoids, vitamins, and plant-based oils, emphasizing their growing importance in contemporary sunscreen formulations.(8)

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

## II. LITERATURE REVIEW

| SR. NO. | RESEARCH TOPIC | AUTHOR NAME | JOURNAL NAME | METHOD |
|---|---|---|---|---|
| 1 | Sunscreens: A comprehensive review with nanotechnology applications | Chavda VP, Acharya D, Hala V, Daware S, Vora LK | Journal of Drug Delivery Science and Technology (2023) | Review-based study focusing on formulation strategies and use of nanotechnology to enhance UV protection and stability |
| 2 | Recent advances in sunscreen agents and formulations | Shah Y, Mewada R | International Journal of Pharmaceutical Chemistry and Analysis (2022) | Comparative review of chemical and physical UV filters with emphasis on formulation improvements and photostability. |
| 3 | Review on sunscreens and sun protection factor | Muthumani T, Sudhahar V, Mukhopadhyay T | Research Journal of Topical and Cosmetic Sciences (2015) | Analytical review explaining SPF determination methods and UV radiation effects. |
| 4 | Sunscreens and UV radiation | Diffey BL | Photodermatology, Photoimmunology & Photomedicine (2001) | Experimental and clinical analysis of UV radiation effects and sunscreen efficiency. |
| 5 | Formulation and evaluation of herbal sunscreen lotion | Jawhara MTP, Saji A, Fathima K, et al. | International Journal of Pharmaceutical Sciences (2025) | Experimental formulation using herbal ingredients; evaluation included SPF, pH, stability, and spreadability tests. |
| 6 | Sunscreens: A review | Donglikar MM, Deore SL | Pharmacognosy Journal (2016) | Literature review focusing on natural sunscreen agents and their pharmacological benefits. |
| 7 | Development and evaluation of sunscreen cream containing nanoparticles | Shetty PK, Venuvanka V, Jagani HV, et al. | International Journal of Nanomedicine (2015) | Experimental study using nanoparticle-based formulation; evaluated SPF, antioxidant activity, and stability |
| | | | | |

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

| | | | | |
|---|---|---|---|---|
| 8 | Determination of SPF by UV spectrophotometry | Baby NR, Chakraborty S | YMER Journal | In vitro UV spectrophotometric method for SPF calculation using absorbance data. |
| 9 | Sunscreens: A narrative review | Salih H, Psomadakis C, George SMC | Skin Health and Disease (2024) | Narrative review covering sunscreen efficacy, safety, and regulatory aspects |
| 10 | Formulation and evaluation of sunscreen cream | Tandi DY, Singh V, Kumar N, et al. | Acta Scientific Pharmaceutical Sciences (2024) | Experimental formulation of sunscreen cream followed by evaluation (pH, spreadability, SPF, stability). |
| 11 | Determination of SPF by spectrophotometry | Mansur JS, Breder MNR, Mansur MCA, Azulay RD | Anais Brasileiros de Dermatologia (1986) | Developed the Mansur equation method for in vitro SPF determination using UV absorbance |

**Aim :**

To formulate and evaluate a synthetic sunscreen cream containing suitable UV-filtering agents, and to assess its effectiveness based on parameters such as Sun Protection Factor (SPF), pH, spreadability, viscosity, stability, and overall performance for protection against ultraviolet (UV) radiation.

**Objectives :**

- To conduct physicochemical characterization of the formulation
- To achieve maximum stability of the developed formulation.(9)
- To attain maximum UV protection effect
- To develop various formulations for evaluation
- To inhibit UV radiation transmission into the skin
- To reduce the risk of squamous cell carcinoma and melanoma
- To diminish the degree of baseline skin pigmentation. (10)

**NEED OF WORK :**

The need for developing and evaluating sunscreen formulations arises primarily due to the increasing exposure of human skin to harmful ultraviolet (UV) radiation. Continuous exposure to UV rays, especially UV-A and UV-B, leads to several adverse effects such as sunburn, premature aging, hyperpigmentation, and even serious conditions like Skin cancer. Commercially available sunscreens often present limitations such as poor stability, inadequate sun protection factor (SPF), skin irritation, greasiness, and lack of water resistance. Therefore, there is a need to formulate an effective sunscreen cream that overcomes these drawbacks while providing broad-spectrum protection. An ideal sunscreen should be non-toxic, non-irritant, cosmetically acceptable, stable under sunlight, and capable of uniformly protecting the skin. In summary, this work is needed to design a safe, effective, and stable sunscreen formulation and to scientifically evaluate its performance, ensuring it meets both therapeutic and cosmetic requirements.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

## III. PLAN OF WORK

1. Literature Review
2. Material and Instruments
3. Experimental method
• Sample collection
• Identification tests
4. Evaluation tests

Physical parameter
• Determination of pH
• Spreadability
• Washability
• Homogeneity
• Stability Testing
• Determination of antioxidant activity
• Determination of SPF

## IV. EVALUATION PARAMETER OF SUNSCREEN

**1. Physical parameters:**

• Colour: Visually inspected and observed manually.
• Odour: Assessed by smelling the formulation
• Appearance: Examined for overall look and texture

**2. Determination of pH:**

1 g of cream was weighed and dispersed in 10 ml of filtered water. pH was measured using a digital pH meter. Measurements were taken three times, and standard deviation was noted.( expected pH 6-7)[11]

**Spread ability:**

Placed excess sample between two glass slides Applied 50 g weight for 3-5 minutes to compress to a uniform thickness. Measured time taken to separate slides.
Spreadability calculated using the formula: The formula for calculating it is:
$S = M \times L / t$ [12]
Where,
M = weight tied to the upper slide
L = length of glass slide
T= time taken to separate the slides

**Wash ability:**

Applied a small amount of cream to the hand
Washed under running water to check washability

**Homogeneity:**

Checked by visual inspection and touch.[13]

**Irritancy Test:**

Applied a small amount of sunscreen cream on the dorsal side of the hand; observed for irritation after 5-6 minutes.

**Stability Testing:**

Keep cream for 24 – 48 hours[14]

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

**SPF :**

Procedure to Determine SPF by UV Spectrophotometer

**Principle**

SPF is calculated by measuring absorbance of the sunscreen solution in the UVB region (290–320 nm) and applying a mathematical equation.

**Materials Required**

UV–Visible spectrophotometer, Volumetric flasks (10, 50, 100 mL) Analytical balance,
Ethanol (or suitable solvent like methanol), Whatman filter paper, Quartz cuvette.

**Preparation of Sample Solution**

Weigh accurately 1 g of sunscreen cream, Transfer to a 100 mL volumetric flask.
Add ethanol and sonicate/shake to dissolve properly.
Make up the volume to 100 mL with ethanol.
Filter the solution to remove insoluble particles
Dilute further if required (commonly 1:10 dilution)

**Spectrophotometric Measurement**

Set spectrophotometer in UV range (290–320 nm)
Use ethanol as blank
Measure absorbance at intervals of 5 nm

**Calculation of SPF**

Use the Mansur equation:
Where:
CF = Correction factor (usually 10)
EE(λ) = Erythemal effect spectrum
I(λ) = Solar intensity spectrum
Abs(λ) = Measured absorbance

**Standard EE × I Values Table**

Wavelength (nm)
EE × I value(15)

**Final Calculation Step**

**Table No. 1 Absorbance**

| λ (nm) | Absorbance | EE × I | Product |
|---|---|---|---|
| 290 | 0.3329 | 0.0150 | 0.00499 |
| 295 | 0.3029 | 0.0817 | 0.02475 |
| 300 | 0.2829 | 0.2874 | 0.08129 |
| 305 | 0.1864 | 0.3278 | 0.06110 |
| 310 | 0.0839 | 0.1864 | 0.01564 |
| 315 | 0.0633 | 0.0839 | 0.00531 |
| 320 | 0.0180 | 0.0180 | 0.00032 |

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 9, May 2026 Impact Factor: 8.2

Mansur Equation - $SPF = CF \times \sum_{290}^{320} EE(\lambda) \times I(\lambda) \times Abs(\lambda)$
Where:
CF = 10
EE × I values are standard constants
Add All Product Values. Apply Correction Factor (CF = 10)
SPF=1.934

## V. MATERIALS AND METHODS

**Table no. 2 : Chemicals**

| Sr. No. | CHEMICALS | QUANTITY |
|---|---|---|
| 1 | Stearic Acid | 4gm |
| 2 | Cetyl Alcohol | 1gm |
| 3 | Liquid Paraffin | 3ml |
| 4 | Zinc Oxide | 0.8gm |
| 5 | Glycerine | 2ml |
| 6 | Triethanolamine | 0.5ml |
| 7 | Methyl Paraben | 0.2gm |
| 8 | Purified Water | Quantity sufficient (28ml) |
| 9 | Perfume | Quantity sufficient ( 2-3drops) |

**INSTRUMENTS :**

**Table no. 3 : Instruments**

| Sr. no. | INSTRUMENTS | MANUFACTURER |
|---|---|---|
| 1. | Analytical balance | Contech Pvt.Ltd. |
| 2. | Digital pH meter | Labrotronics Pvt.Ltd. |
| 3. | UV spectrophotometer | Lab India Pvt. Ltd. |

**METHODS OF PREPARATION :**

**Preparation of Oil Phase**

Take stearic acid (4 g), cetyl alcohol (1 g), and liquid paraffin (3 ml) in a clean beaker.
Heat the mixture on a water bath at 70–75°C until all solids melt completely.
Add zinc oxide (0.8 g).
Stir continuously to ensure uniform dispersion (especially zinc oxide, to avoid lumps).
Maintain the temperature so the phase remains fully liquid.


DOI: 10.48175/IJARSCT-35686

**Preparation of Aqueous Phase**

In another beaker, take purified water (q.s. to 28 ml used initially).

Add glycerin (2 ml) as a humectant.

Add methyl paraben (0.2 g) as preservatives.

Heat this mixture to 70–75°C to dissolve all ingredients properly.

Add triethanolamine (0.5 ml) and stir well (this helps in emulsification and pH adjustment).

**Emulsification Process**

Ensure both phases are at the same temperature (70–75°C).

Slowly add the aqueous phase into the oil phase with continuous stirring.

Stir constantly to form a uniform water-in-oil (W/O) emulsion.

Continue stirring until a smooth, creamy consistency is obtained.

**Cooling and Finishing**

Allow the cream to cool gradually with gentle stirring.

When temperature falls below 40°C, add perfume (2–3 drops).

Mix gently to avoid air incorporation. [16]

BATCH – 1

BATCH - 2

**DRUG PROFILE :**

**Stearic Acid :**

**USE :** Emulsifier, Stabilizer, Opacifying Agent[17]

**Cetyl Alcohol :**

**USE :** Thickener, Emollient

**Liquid Paraffin :**

**USE :** Improve Spreadability, Vehicle, Moisturizing[18]

**Zinc Oxide :**

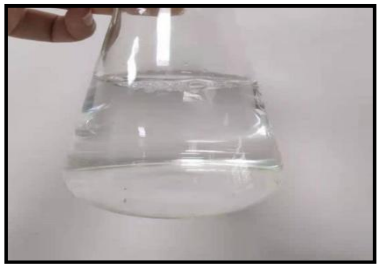
**USE :** Broad Spectrum Protection from UVA and UVB Rays[19]

**Glycerine :**


**USE :** Humectant, Improve Structure

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

**Triethanolamine :**



**USE :** Ph Adjuster, Emulsifier, Thickener

**Methyl Paraben :**

**USE :** Anti-microbial Preservative[20]

**Purified Water :**

**USE :** Primary high purity solvent

**Perfume :**


**USE :** Mask chemical odour


DOI: 10.48175/IJARSCT-35686

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

## VI. RESULT AND DISCUSSION

**Physical parameters:**

Colour :. white cream

Odour: Pleasant characteristic odour

Appearance: smooth appearance.

**Figure no. 3**

**Determination of pH:**

**Figure no. 4 pH**

Result – obatain pH = 6.68.

**Spread ability:**

**Figure no. 5 Spreadability**

S =M × L / t

Where,

M = weight tied to the upper slide

L = length of glass slide

T= time taken to separate the slides

S =M × L / t

S= 50 × 7.4 / 12

ISSN: 2581-9429
Volume 6, Issue 9, May 2026
Impact Factor: 8.2

S= 370 ÷ 12
Spreadability = 30.83 g.cm/sec

**Wash ability:**

**Figure no. 6 Washability**

Result – Easily washable

**Homogeneity:**

Result – homogenous.

**Irritancy Test:**

**Figure no. 7 Irritancy**

Result – No irritation

**Stability Testing:**

Result – no phase separation (cream is stable).

**SPF :**

Mansur Equation - $SPF = CF \times \sum_{290}^{320} EE(\lambda) \times I(\lambda) \times Abs(\lambda)$

Where:
CF = 10
EE × I values are standard constants
Add All Product Values. Apply Correction Factor (CF = 10)
SPF=1.934
SPF~2
Result = SPF value of sunscreen = 2

## VII. SUMMARY

Promoting sunscreen use is an integral part of prevention programs aimed at reducing UV radiation induced skin damage and skin cancers. Protection against both UVA and UVB advocated. The used spectrophotometric method, to calculate SPF is an inexpensive and easy to apply. The SPF is a quantitative measurement of the effectiveness of a sunscreen formulation. To be effective in preventing sunburn and other skin damage, a sunscreen product should have a wide range of absorbance between 290-400nm.In this research sunscreen lotion containing stearic acid and zinc oxide


DOI: 10.48175/IJARSCT-35686

evaluated by UV spectrophotometry. From the result obtained in the study we can positively conclude that Synthetic sunscreens have significant UV absorbing property. It will also help in broadening the UV protection ability of the conventional sunscreen formulation. The present work focus on the scientific amount of synthetic drug in cosmetics.

## VIII. CONCLSION

Regular use of sunscreen plays a vital role in protecting the skin from harmful ultraviolet (UV) radiation. Proper and consistent application can help lower the risk of sunburn, premature skin aging, and different forms of skin cancer caused by prolonged exposure to UVA and UVB rays. Nevertheless, sunscreen should not be considered the only method of sun protection, and it is most effective when combined with other protective measures such as wearing protective clothing and limiting direct sun exposure. The growing awareness of UV-related skin damage has increased the demand for sunscreen products made with both synthetic and natural ingredients.

## REFERENCES

**[1].** National Academies of Sciences, Engineering, and Medicine. Environmental impact of currently marketed sunscreens and potential human impacts of changes in sunscreen usage. Washington (DC): National Academies Press (US); 2022 Aug 9.

**[2].** Chavda VP, Acharya D, Hala V, Daware S, Vora LK. Sunscreens: A comprehensive review with the application of nanotechnology. Journal of Drug Delivery Science and Technology. 2023;86:104720.

**[3].** Shah Y, Mewada R. Recent advances in sunscreen agents and their formulations: A review. International Journal of Pharmaceutical Chemistry and Analysis. 2022;9(4):141–150.

**[4].** Muthumani T, Sudhahar V, Mukhopadhyay T. Review on sunscreens and sun protection factor. Res J Topical Cosmet Sci. 2015;6(2):55–65. Doi:10.5958/2321-5844.2015.00009.6.

**[5].** Diffey BL. Sunscreens and UV radiation. Photodermatol Photoimmunol Photomed. 2001;17(3):109–114.

**[6].** Jawhara MTP, Saji A, Fathima K, Nayana K, Divyan R, Arunkumar KV. Formulation and evaluation of herbal sunscreen lotion. Int J Pharm Sci. 2025;3(7):88–95. Doi:10.5281/zenodo.15782377.

**[7].** Shah Y, Mewada R. Recent advances in sunscreen agents and their formulations: A review. Int J Pharm Chem Anal. 2022;9(4):141–150. doi:10.18231/j.ijpca.2022.027

**[8].** Donglikar MM, Deore SL. Sunscreens: A review. Pharmacogn J. 2016;8(3):171.

**[9].** Barel AO, Paye M, Maibach HI. Handbook of Cosmetic Science and Technology. 4th ed. Boca Raton: CRC Press; 2014.

**[10].** Abhishek D. Purohit, Rahul A. Bisen, Kajal D. Gajbhiye, Kiran S. Ukey, Aachal H. Baghele, Madhuri I. Sharnagat. Manoharbhai Patel Institute of Bachelor of Pharmacy, Kudwa, Gondia, Maharashtra, India. Submitted 2023 Jun 23. Accepted 2023 Jul 12. Published 2023 Jul 30.

**[11].** Kazi S, Bais S, Dhabekar A. Preparation and evaluation of sunscreen cream. Int J Pharm Sci. 2025;3(6):3545–3554. Doi:10.5281/zenodo.15719679.

**[12].** Sharma PP. Cosmetics: formulation, manufacturing and quality control. 5th ed. New Delhi: Vandana Publications; 2014.

**[13].** Jain NK. Pharmaceutical product development. New Delhi: CBS Publishers and Distributors; 2000.

**[14].** Aulton ME, Taylor KMG. Aulton's pharmaceutics: the design and manufacture of medicines. 5th ed. Edinburgh: Elsevier; 2018.

**[15].** Mansur JS, Breder MNR, Mansur MCA, Azulay RD. Determination of sun protection factor by spectrophotometry. An Bras Dermatol. 1986;61(3):121–4.

**[16].** Shetty PK, Venuvanka V, Jagani HV, Chethan GH. Development and evaluation of sunscreen creams containing morin-encapsulated nanoparticles for enhanced UV radiation protection and antioxidant activity. Int J Nanomedicine. 2015;10:6477–6491.

**[17].** Priani SE. Formulation and characterization sunscreen emulgel containing cinnamon bark oil (Cinnamomum burmannii Nees Ex Blume). Indones J Pharm Sci Technol. 2023;10(2):95-104.

**[18].** 8.Jiang R, Roberts MS, Prankerd RJ, Benson HA. Percutaneous absorption of sunscreen agents from liquid paraffin: self-association of octyl salicylate and effects on skin flux. J Pharm Sci. 1997;86(7):791-

**[19].** Sirelkhatim A, Mahmud S, Seeni A, Kaus NHM, Ann LC, Bakhori SKM, et al. Review on zinc oxide nanoparticles: antibacterial activity and toxicity mechanism. Nano Micro Lett. 2015;7(3):219-42.

**[20].** 10.Reddy VS. Formulation and evaluation of sunscreen cream. Asian J Pharm. 2025;19(4)