

# Ultimate Sun Protection: Glow Shield Sunscreen

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**Abstract**—The objective of this research was to create sunscreen cream formulas with high sun protection factor (SPF) and useful characteristics. Some aspects of the sun-skin interactions are contentious. Applying sunscreen topically and limiting exposure to the sun's rays are universally accepted as the best ways to prevent sunburn and oedema. Citric acid serves as a preservative, glycerine moisturises, Arabic gum thickens, and distilled water serves as the main solvent in the water phase required to create the sunscreen. Three distinct formulations of sunscreen lotions were created, and their SPF, stability, and safety were assessed. Based on the findings, the sunscreen lotions were stable, non-irritating, and they were non-mutagenic and had an SPF suitable for normal skin. This evaluation article sought in order to supply more detail on the scientific basis, categorisation, formulation, quality assurance, and evaluation of sunscreen application.

**Keywords**— Sun screen, UV filter, UV protection, SPF, and UV radiation.

## I. INTRODUCTION

Applying a lotion or liquid help shield the skin from the damaging effects of the sun and prevent sunburn is known as sunscreen. Instead of using sunscreen, "sun-tan lotion" in the US usually refers to a moisturiser that maximises UV exposure. as opposed to tanning and blocking it.[1]. Sunscreen can be any topical medication that either reflects or absorbs some of the ultraviolet (UV) rays from the sun. Other names for it include suntan lotion, sunblock, and sun-cream. One kind of cosmetic product that has grown in popularity recently is sunscreen, which offers additional health benefits in addition to visual appeal.[2] All electromagnetic waves fall within the range, which is between 100 nm and 1 mm. The shortest wavelengths are 400–740 nm for visible light, 760–1,000,000 nm for infrared radiation, and 200–400 nm for ultraviolet light. 10% or so of the light produced by sunlight is UV radiation. Three acceptable ranges for UV radiation are UVA, UVB, and UVC. UVB is in the middle (280–320 nm), though it has the lowest energy, UVA has the longest wavelength (320–400 nm). The photons in that region are small (100–280 nm), but they have the highest energy.[3] Research has demonstrated that moderate exposure to the sun has many advantages, such as increased vitamin D production, antibacterial action, and better cardiovascular health [6,7].

### Advantage:

1. Your skin is protected by sunscreen, which also lowers your vulnerability to skin precancers and cancer.
2. All types of skin are protected by sunscreen.
3. Even if your skin's melanin provides some protection against sunburns, you still need to shield it from the damaging UV rays if you have a darker complexion.
4. No specialised tools are required for preparation.
5. Renewably sourced materials.
6. It is easy to find botanical components [8,9,10].



Fig. 1: Sunscreen cream

### Disadvantages:

1. Skincare products containing PABA have a high risk of allergic reactions.
2. It may aggravate acne.
3. It might hurt places with hair.
4. Occasionally result in pus in the hair follicle [11].

### History:

In 1928, early synthetic sunscreens were introduced. Eugène Schueller, a French scientist and the originator of L'Oréal, presented in 1936 saw the introduction of the first noteworthy commercial product. The first sunscreen was created in 1938 by Franz Greiter to shield his skin from the sun, and in 1944 by Benjamin Green. Green used a blend of red veterinarian petroleum and cocoa butter.[12] Franz Grieter is also renowned for coining the term "Sun Protection Factor," or "SPF." The harsh UV radiation burned Greiter to death as he ascended an Appalachian mountain range [13]. The first ways to shield skin from the sun were with clothing, scarves, and shade [14].

## II. CLASSIFICATION

### A. Inorganic(physicalblockers):

These particles give back ultraviolet light to the surroundings by scattering and reflecting them. They serve as a physical defence against UV and infrared rays. Zinc oxide (ZnO) with titanium dioxide (TiO<sub>2</sub>) white particles, They are the two primary inorganic UV filters used in the cosmetics and pharmaceutical industries. Today's agents include talc, ichthammol, calamine, red veterinary petrolatum, ZnO, and TiO<sub>2</sub>. They can discolour clothing and be visible due to white pigment remnants on the skin, even though they are generally less toxic, more stable, and safer for humans than those of organic compounds [15, 20].

**B. Organic (chemical absorbers):**

When UV light is excited to a higher energy state, organic UV filters like benzophenones absorb it. These are often carbonyl-linked aromatic molecules. Their protection range is divided into three general categories: UVB (290–320 nm), UVA (320–400 nm), and broad-spectrum sunscreens, which cover the whole spectrum (290–400 nm) [21]. Certain organic filters, such as PABA, PABA derivatives, and benzophenones, in particular, have significant adverse effects, such as eczematous dermatitis, burning sensations, and an elevated risk of skin cancer [22, 23].

**C. Natural/Systemic (chemical absorbers):**

Natural substances like polyphenols (flavonoids, tannins), carotenoids, anthocyanidins, a few vitamins, triglyceride oils, volatile oils from vegetables, fruits, medicinal plant parts (leaves, flowers, fruits, berries), algae, and lichens are more effective than synthetic ones due to their long-term benefits, especially against UV-ray blocking and skin damage caused by free radicals [24]. After being absorbed by the body, these sunscreens build up in the skin to offer protection from UV rays [25].

**III. APPLICATIONS**

- a. Sunscreens are tested by the FDA two milligrammes per centimetre of skin that is exposed [26].
- b. According to research, the majority of consumers only use between 1/4 and 1/2 of the suggested amount to achieve the claimed SPF, or sun protection factor; Consequently, it is recommended that the effective SPF be reduced to the square or fourth root of the quantity sold [27].
- c. More linear than expected, the results of a follow-up investigation showed a substantial exponential association between SPF and sunscreen application [28].
- d. By simply dividing the quantity of sunscreen (in grammes) by the squared area of skin treated with sunscreen (in centimetres), one can determine the application thickness [29].

**IV. NATURAL SUNSCREENS**

**Aloe vera:**

Aloe vera gel is made from the leaves of *A. barbadensis* and aloe vera. Because of its moisturising and revitalising qualities, aloe vera gel is frequently used in hygiene and cosmetics. It preserves the natural moisture balance of the skin by blocking UVA and UVB rays. Acemannan is a D-isomer

mucopolysaccharide that promotes the production of collagen and fibroblasts, which in turn speeds up the healing process. Aloe extracts and aloin from the plant can be applied as sunscreen to the skin and hair because of their spectrophotometric peaks at about 297 nm [30, 31&32]. Finding out if aloe vera juice has any photoprotective effects on chemically coloured Asian hair—specifically, black and grey—was the aim of the study. Hair exposed to the environment and left untreated had higher chemical damage, according to tryptophan concentration measurements; however, Aloe vera juice treatment provided UV protection for hair [33].



Fig. 2: Aloe vera

**Green Tea:**

*Camellia sinensis* leaves must be fresh in order to make green tea. The main mediators preventing chemotherapy seem to be polyphenols. Green tea contains four main forms of polyphenols: Epicatechin (EC), Epicatechin-3-gallate (ECG), Epigallocatechin (EGC), and Epigallocatechin-3-gallate (EGCG). Alkaloids theophylline, flavonoids, phenolic acids, and caffeine along with bromine are also present. According to Wang's research, the polyphenols in green tea have long been thought to provide protection against UV-induced skin cancer. Green tea can be utilised as soon as feasible after exposure to help guard against at least part of the UV radiation's biological impacts. It is also useful when taken systemically. The rate at which green tea absorbs UVB and UVA rays is modest [34, 35, 36].



Fig. 3: Green tea

Leukocytes (macrophages/neutrophils) that may have generated PG metabolites and reactive oxygen species (ROS) were prevented from invading by UVB. Before human skin encountered UVB (4 MED), topical EGCG (3 mg/2.5 cm<sup>2</sup>) treatment significantly lowered myeloperoxidase activity and UVB-triggered leukocyte infiltration [37, 38].

**Almonds:**

Almonds are marketed under the name "almonds." Polyphenolic chemicals, particularly flavonoids and phenolic acids, are abundant in seeds. Seeds are rich in polyphenolic compounds, especially flavonoids and phenolic acids. The skin extract from this plant was evaluated for its protective efficacy against UVB radiation. Alterations in glutathione levels and lipid peroxidation were examined following the mice's exposure to UVB light. Animals that received the produced cream topically two hours prior to and following radiation showed reduced peroxidation of lipids and elevated glutathione levels. The findings demonstrate the cream formulation's strong anti-photoaging and antioxidant qualities when applied topically [39, 40, 41].



Fig. 4: Almonds

**V. MATERIALS**

International Journal of Pharmaceutical Studies Chemicals included stearic acid, cetyl alcohol, liquid paremulgide, and oil phases like emulgide [42]. [42] honey butter, [43] coco butter, [43] sweet almond oil, [43] tea tree oil, [44] grape seed oil, [44] coconut oil, [44] tween 80, [43] bees wbee, [44] and so forth. Water stages include distilled water, rose water, deionised water, triethanolamine, glycerin, and [42, 43][44] additions such sea wood extracts, [42] moringa pomorin, and [42] methyl paraben.

**VI. EVALUATION OF CREAM**

1. **Colour:** In diffuse daylight, 0.2 g of the material was placed on a white background, and its colour was evaluated by observing it. This made it possible to identify the hue of the chemical.[43]
2. **Odour:** A 5 cm diameter watch glass containing 0.4 g of the substance was left for 15 minutes. The scent of the

compound was then determined by frequently and slowly inhaling the air above the sample. By classifying the scent as either fruity, musky, rotting, mouldy, or fragrant, and by classifying the smell experience as either non-existent, mild, distinct, or strong, the intensity of the odour was evaluated.[43]

3. **Hygroscopicity:** Determine the hygroscopicity by first weighing the empty China dish and then the China dish containing the sample. Repeatedly weigh the dried sample after it has been placed in an electric oven and left there for a full day.[43]
4. **Spreadability:** The International Journal of Pharmaceutical Studies The ease of application of the sunscreen determined its therapeutic efficacy. The two sides glided off in the designated number of seconds when a specific load direction was applied and two slides were separated by the proper amount of sample. Spread ability is the ability to take two slides and separate them in less time.
5. **Determination of viscosity:** With the right number of spindles selected, viscosity was assessed using the Brookfield viscometer (RVD-II + PRO). A 50 ml beaker containing 50 g of preparation was used to dip the spindle groove and regulate the rpm. At 5, 10, 20, 50, and 100 rpm, the viscosity of the herbal sunscreen lotion was measured. The factor derived from the reading was used to calculate the viscosity.[45]
6. **Determination of PH:** We used a digital PH meter to determine the sunscreen's PH. Two hours after dissolving 1g of the formulation in 100 ml of freshly made distilled water, the PH was tested.
7. **Rancidity:** An unpleasant taste and aroma can result from rancidification, a partial or complete fats and oils undergo hydrolysis or oxidation caused by exposure to bacteria, moisture, light, or air. Using the phloroglucinol solution, rancidity is achieved. Free fatty acids are released when fats and oils oxidise, which is what causes the rancidity. The phloroglucinol solution turns pink when these free fatty acids react with it, indicating that it is rancid. Ten millilitres each of strong hydrochloric acid and phloroglucinol solution were added to ten millilitres of cream, and the mixture was stirred for a minute. If the cream doesn't turn pink, it should have passed the test. In [44]8.
8. **Skin irritation test:** Medicinal Studies Journal The skin irritation investigation was conducted using six rats of each sex in each of the three healthy at International groups (1273/PO/Re/S/09/CPCSEA). They had unrestricted access to water and were fed standard animal feed. On one of the research days, the rats' backs were shaved, and both sides of the area were delineated with 5 cm<sup>2</sup>. There were two sides: a control side and a testing side.[40]
9. **In vitro evaluation by UV spectroscopy:** After weighing and putting one gramme of the produced cream into a 100 millilitre volumetric flask, it was diluted with n-butyl alcohol to volume and ultrasonically filtered through a cotton filter, discarding the first ten millilitres after five minutes. A 25 ml volumetric flask was then filled with a 5

ml aliquot, and n-propyl alcohol was used to regulate the content. Samples should have absorption spectra between 290 and 400 nm when using a 1 cm quart cell while n-butyl alcohol is used as the blank solution.[40]

10. *Determination of sun protection factor (SPF)*: Usually used to show how effective a sunscreen is, in order to calculate the sun protection factor (SPF), the UV energy needed to produce a minimal erythema dose (MED) on protected skin is divided by the UV energy needed to produce a MED on unprotected skin.

### VII. CONCLUSION

One of the most important aspects of sun protection is using sunscreen. Use that is suitable and consistent has been linked to a lower risk of cancer and other skin conditions brought on by UV radiation. Additionally, patients should be informed that applying sunscreen is insufficient on its own. One could argue since sunscreen compounds, whether natural, synthetic, or a mix of the two, have a substantial market, since people understand how important it is to guard against damaging UVA and UVB rays.

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