



# PREPARATION AND EVALUATION OF HERBAL SUNSCREEN CONTAINING ALOEVERA, CAMELIA, SINESIS AND CURCUMA : A REVIEW

<sup>1</sup>Prashant Rana, <sup>2</sup>Diksha Dhiman, <sup>3</sup>Pranav Malagar, <sup>4</sup>Rajat Kumar, <sup>5</sup>Dr. Rajesh Gupta,

Sri sai college of pharmacy, Badhani ,Pathankot(Punjab),India

## ABSTRACT:

Despite being a source of life and energy, sunlight is associated with a number of serious health risks, including immunological suppression, aging, sunburn, pigmentation, wrinkles, dermatitis, and urticaria. Sunglasses and/or clothing that protects against the sun's rays are insufficient and less useful as a remedy to all of these health problems. As a result, sunscreen use is widespread around the world. In the current article, we discuss sunscreen kinds, classifications, rules, terminology, evaluation procedures, labeling, dose, and debates. Additionally, classifications of natural chemicals such oils, carotenoids, vitamins, and phenolics are discussed (tannins, flavonoids).

**Keywords:** Antioxidant., COLIPA, IPD, ISO, Polyphenols, PPD, SPF, UV rays.

## INTRODUCTION:

The Greek term "kosm tikos," which meaning having the skill to design and adorn, is where the word "cosmetic" originates. Any product meant to be rubbed, poured, sprinkled, sprayed, injected into, or otherwise applied to the human body or any portion of the body for cleansing, beautifying, encouraging attractiveness, or changing the appearance is considered a cosmetic<sup>1</sup>. Cosmetics also include any item that is intended to be used as a component of cosmetics<sup>2-3</sup>. Cosmetics are regulated in India in accordance with the provisions of the Drug and Cosmetic Act 1940 and Rules 1945 published in the Gazette notice G.S.R 426. (E). (NP) Over the course of human history, cosmetics have changed, and a consistent tale about their origins has arisen.. Despite being applied topically as cosmetics, they contain chemicals that have an impact on the biological processes of the skin<sup>5-6</sup>. Cosmetics improve appearance, but they do so by giving skin the nutrition it needs to be healthy<sup>7</sup>. Herbal cosmetics are goods that are used to enhance and improve one's look. An item is considered to be "herbal cosmetics" if it contains one or more herbal ingredients used alone to provide the desired cosmetic benefits on top of a base of other acceptable cosmetic ingredients.

## NEED OF STUDY:

1. The goal of sunscreen formulation is to block UV rays and increase the level of protection from the UV rays.
2. Used regularly, sunscreen helps prevent sunburn, skin cancer and premature aging.
3. Sunscreen reduce the deleterious effect of ultraviolet radiation (UVR) by absorbing, reflecting, or scattering photons.
4. It should be non-toxic and non-irritant.
5. Avoid inflammation, redness and prevent the early onset of wrinkles and fine lines.

## SUNSCREEN:

The word "cosmetic" is derived from the Greek word "kosm tikos". By reflecting or absorbing some of the sun's ultraviolet (UV) radiation on skin that has been exposed to the sun, sunscreen is a lotion, spray, gel, or other topical preparation that helps prevent sunburn. It is also known as block out, sun block, sun tan lotion, sun screen, and sunburn cream. Since the beginning of time, the sun

has provided energy and life. Recent studies, however, have shown that exposure to the sun's rays is the main contributor to adverse outcomes, including both short-term consequences (such as sunburn and drug-induced phototoxicity) and long-term risks, including sunburn, crack, melanoma and pigmentation, cancer, and immune suppression.

### Skin and ultra-violet radiation<sup>8-9</sup>:

Ultraviolet (UV) radiation is the name given to the spectrum of electromagnetic energy that lies between X-rays and visible light, between 200 and 400 nm. There are three types of ultraviolet radiation based on wavelength:

**Ultraviolet-A rays:** UV-A light has a wavelength that ranges from 320 to 400 nm. UV-A is the radiation that promotes quick tanning or skin darkening the most due to excessive melanin synthesis in the epidermis, early photoaging, suppression of immunologic processes, necrosis of endothelial cells, and even damage to dermal blood vessels.

**UV-B Radiation:** UV-B light has a wavelength of between 280 and 320 nm. UV-B rays are sometimes known as "burning rays" due to their 1000 times greater ability to damage skin than UV-A radiation. Ultraviolet B (UVB) rays, which change depending on the season and time of year, are mostly responsible for sunburn. Sunburned skin is a significant risk factor for both melanoma and non-melanoma skin cancer.

**UV-C Radiation:** This radiation has a wavelength of 200–280 nm. UV-C rays are reduced in intensity and effectiveness thanks to the stratospheric ozone layer. The human skin is the largest organ in the body, with a surface area of around 1.5–2.0 m<sup>2</sup>. Skin acts as a powerful barrier between the body and the harmful effects of xenobiotics and environmental contaminants<sup>10</sup>.

### MECHANISM OF PHOTOREACTION :

Reactive oxygen species (ROS) generated by light are now understood to play a role in photocarcinogenesis<sup>12</sup> and photoaging of the skin. The human dermis and dermal capillary system are efficiently damaged by photo-oxidative damage caused by 12 UVA rays via the top layers of skin. The stratum corneum, epidermis, and dermis of human skin experience severe enzymatic and non-enzymatic antioxidant depletion along with significant protein and lipid oxidation. The photo-oxidation of pre-existing melanins and its precursors, respectively, is what causes the immediate as well as chronic pigment darkening (IPD or PPD) reactions in human skin. After exposure to sunlight, several other enzymes are also up-regulated, including hemoxygenase-1 (HO-1), ferritin, glutathione peroxidase, Cu-Zn-dependent superoxide dismutase (SOD1), manganese-dependent superoxide dismutase (SOD2), and catalase<sup>13</sup>.

Upon coming into contact with UV radiation, protein kinase C enzyme and reactive oxygen species are activated. Reactive oxygen species then react with protein lipids and DNA to produce cyclobutane pyridine dimmers. Erythema, edema, skin sunburn, and cell death are the results of this. On keratinocytes and fibroblasts in human skin, UV radiation activates cell surface growth factor and cytokine receptors, which are important in the control of cell proliferation and survival<sup>14</sup>. The epidermal growth factor receptor (EGF-R tyrosine )'s kinase activity is controlled by UV-driven generation of H<sub>2</sub>O<sub>2</sub>, and recent research reveals that UV-induced ROS creation also inhibits protein tyrosine phosphatases. Fitzpatrick's skin type classification<sup>15</sup>, which considers a person's reaction to UV exposure, is the most common.

**Protection:** Use of sun protective clothing, sunglasses, hats, umbrellas, and shade, as well as potential sun avoidance, are physical barriers<sup>16</sup> to sunlight that can be used for protection. For a variety of sociological reasons, including their ease of use and higher level of protection, sunscreens are the most well-known and extensively utilized type of sun protection<sup>17-18</sup>. Many animals use mud as a physical barrier to reflect UV radiation and prevent sunburns, such as elephants putting on sunscreen. The UV protection factor (UPF), which is the ratio of average effective UV radiation irradiance transmitted and measured via air to the average, is the acknowledged method for evaluating sun protection gear<sup>19</sup>. During testing, fabric is used to protect the skin rather than sunscreen, despite the fact that fabric UPF is comparable to sunscreen SPF.

GRADES	UPF
Good protection	15-24
Very good protection	25-39
Excellent protection	40-50+

**Sunscreen Regulations:** Sunscreens are typically assessed using one of the following methods and must adhere to country-specific labeling requirements:

- **US-FDA method:** The FDA proposal uses the critical wavelength method to calculate in-vitro<sup>20</sup> UV transmission through sunscreen film. Less than 320 nm would be the critical wavelength for sunscreens offering solely UVB protection, and between 320 and 400 nm would be the key wavelength for sunscreens providing both UVB and UVA protection.

- **UK method of boot star rating:** The UV transmittance through a sunscreen film is also measured using the UK approach, known as the Boots star rating system. Abraded PMMA plates are the measuring substrate. Calculated is the ratio between the mean UVA and UVB absorbance measured before and after the sunscreen products were exposed to UV radiation.

• **Australia:** The Australian Standard (AS) approach employs a spectrophotometer to detect the solar radiation that sunscreen products transmit in order to determine the amount of UVA radiation that the product absorbs. A product only qualifies as a long wave protector, in accordance with this test, if it transmits less than 10% of the incoming UV light between 320 and 360 nm.

• **European countries:** The cosmetics industry's COLIPA association voluntarily spearheads the harmonization of sunscreen product testing and labeling initiatives. Sunscreens of the liquid and emulsion variety are the focus of COLIPA guidelines. The evaluation of UV transmittance through a thin film (0.75 mg/cm<sup>2</sup>) of the sunscreen sample spread on a roughened substrate, both before and after exposure to a controlled dose of UV radiation from a precisely specified UV source, should serve as the foundation for the test for UVA protection factors (UVAPF).

• **International Organization for Standardization (ISO):** It is a Geneva-based autonomous, non-governmental international organization that has 162 national standards bodies as members. 28 The following lists many ISO procedures for sunscreens.

• **ISO 24443:2012** outlines a "in-vitro" method for describing sunscreen products' UVA protection. Details are provided to make it possible to determine the spectral absorption properties of UVA protection in a repeatable manner. The approach has been developed to give a UV spectral absorbance curve from which a number of calculations and evaluations can be made in order to identify pertinent UVA protection factors. This technique scales the UV absorption curve using in-vivo SPF values.

• **ISO 24442:2011** An "in-vivo" method for evaluating the UVA protection factor (UVAPF) of topical sunscreen lotions. It applies to cosmetics, medications, and other items designed to be applied topically to human skin, including any UV-absorbing, UV-reflecting, or UV-scattering elements. The evaluation of sunscreen products for shielding human skin from UVA rays from the sun or other light sources is based on ISO 24442:2011.

• **ISO 24444:2010** outlines a procedure for figuring out the sun protection factor (SPF) of sunscreen lotions in-vivo. The items covered by this International Standard are those that are designed to come into contact with human skin and contain any component that can absorb, reflect, or scatter ultraviolet (UV) rays.

• **ISO 24444:2010** The evaluation of sunscreen products for shielding human skin against "erythema" brought on by solar UV rays is based on ISO 24444:2010.

In the nations listed below, sunscreens are normally assessed using one of the aforementioned methods and meet labeling requirements as per national regulations.

• **India:** <sup>21</sup>An Indian Asians typically have Type-IV skin, which burns less and tans more readily. Despite the rarity of freckles, sunscreen application is nevertheless advised to prevent tanning. Sunscreens are classified as cosmetics under Indian rules, which are based on the 1940 Indian Drug and Cosmetic Act, as revised from time to time. The pertinent standards for cosmetic products are established by the Bureau of Indian Standards (BIS), a member of the ISO.

.The necessity of stability data and the absence of a maximum SPF rating for sunscreens are important points.

• **Japan:**Japan's self-regulatory standards are provided by the Japan Cosmetic Industry Association (JCIA). JCIA has embraced ISO standards when they are released and is a signatory to the COLIPA International SPF test procedure<sup>22-23</sup>. ISO 24444 is acceptable for SPF. In Japan, in-vivo testing for UVA is necessary, and products must be labeled using the Protection Grade of UVA (PA) ratings of +, ++, and +++. PA++++ was additionally included as of January 1, 2013.

• **China:** The Hygienic Standard for Cosmetics 2007 regulates sunscreens. Only SPF 30+ can currently be listed on sunscreen labels. The product must have a Chinese name and be labeled in Chinese<sup>24-25</sup>. Water resistance norms should be followed if labelled.

## A REVIEW OF WORKS:

**S. J. Daharwal, et al., and Jangde R. (2011)** The author of this essay came to the conclusion that a small investment in preventive resulted in significant cost-savings from disease. The FDA recently published its final directives for the sunscreen labeling. Regarding over-the-counter (OTC) sunscreen products, the tentative final monograph is updated in the final monograph. The word "sun block" will no longer be used on sunscreen labels, and there will be three levels of sun protection: minimal, moderate, and high. There will also be a new SPF category of 30+ for products with SPF values higher than 30, standardized, and streamlined labeling for all sunscreens.

This paper by **Patil S, Mishra A, et al. (2020)** has shown that there are numerous herbal plants that may be found in nature. These plants have various constituents that are employed in the development of cosmetics. Because of its beneficial effects and comparative lack of negative side effects compared to synthetic cosmetics, herbal cosmetics have long drawn significant attention. Herbal cleansers, moisturizers, toners, and other products that are produced for everyday use in cosmetics are examples. Depending on the sort of chemicals they include, herbal cosmetics provide medical benefits that influence how the skin's biological functions.

According to this article by **Bijauliya R.K., Shashi Alok, et al. (2017)**, India is a focus for the development of the natural medicine systems Ayurveda, Unani, Siddha, and Homoeopathy (AYUSH). The development of the saundarya prasadka category of herbal cosmetics has a lot of potential and potential in the Ayush Pharmaceutical sector. Natural beauty is a blessing, and cosmetics assist in enhancing and displaying a person's appearance and personality.

According to **F.A. Mosa, Randah O, et al(2018)** 's article, the goal of this research was to create a formulation for sunscreen cream using natural chemicals and determine the sun protection factor (SPF) for it. The water phase is used to make the sunscreen, and it contains citric acid as a preservative, Arabic gum as a thickening, glycerine as a moisturizer, and distilled water as the primary solvent. Paraffin oil, olive oil, sesame oil, or pond oil make up the oil phase, with beeswax foundation serving as an emulsifier. Both zinc oxide

and titanium dioxide are used as inorganic physical sun blockers in sunscreen. The optimum cream texture was achieved when 8% beeswax foundation was used as the emulsifier.

According to **Prof. Talal Aburjai, PhD, I Tayseer et al** article's from 2019, there is a global trend toward the usage of natural cosmetics and the formulation of high-UVA sunscreens utilizing chemical sunscreens at lower concentrations. An efficient tactic to stop the harmful effects of UV radiation may be to combine natural chemicals with synthetic agents. New substances with the capacity to either absorb or block UV light, particularly those produced from plants, have been thoroughly researched.

According to **Surjhushe A, R. Vasani et al. (2008)**, Aloe vera is a natural product that is currently widely employed in the cosmetology industry. Despite the fact that there are several indications for its use, controlled studies are required to ascertain its true efficacy. This article provides a brief overview of the aloe vera plant, its characteristics, mode of action, and clinical applications.

According to **Hewlings S.J. and Douglas S. Kalman et al(2017)** 's study, turmeric, a spice long known for its therapeutic benefits, has drawn interest from both the medical and scientific communities as well as food fans because it is the primary source of the polyphenol curcumin. It helps with the treatment of metabolic syndrome, arthritis, anxiety, and hyperlipidemia as well as oxidative and inflammatory diseases. Additionally, it might aid in the control of inflammation and muscular soreness brought on by exercise, which would improve recovery and performance in athletes.

According to **P.K. Goswami, Mayuri Samant et al. (2013)**, this article has revealed that exposure to ultraviolet B (UVB) radiation damages keratinocytes and can ultimately result in malignant transformation. The initial step in the cellular defense mechanisms against this harm is the UVB-induced death of injured cells. Cell cycle advancement can be stopped in cells that have less severe damage, and nucleotide excision repair can be used to repair DNA damage (NER). Cells will survive if healing is complete and no irreversible damage has been done.

#### NATURAL CHEMICALS AS SUNSCREENS:

Due to their long-term beneficial effects, particularly against free radical generated skin damages along with UV-rays blocking, natural chemicals like polyphenols (flavonoids, tannins), carotenoids, anthocyanidins, a few vitamins, fixed oils, volatile oils from vegetables, fruits, medicinal plant parts (leaves, flowers, fruits, berries), algae, and lichens are more effective than synthetic chemicals. 47-49 These all have potent antioxidant properties. The majority of them also have moisturizing and cooling properties (aloe vera juice, fixed oils), antimicrobial properties (volatile oils), wound healing and anti-inflammatory properties (polyphenols like curcumin), anticancer properties (tannins and resveratrol), anti-aging properties (anthocyanidins, carotenoids, vitamins), and cell rejuvenating properties (anthocyanidins, carotenoids, and vitamins). They are all desirable cosmetic compounds because of their effects. To provide long-term benefits and prevent chronic problems like cancer, photo-radiation-mediated skin damage requires many forms of protection. Consequently, after natural chemicals The use of 47-55 in sunscreen creams may be ideal.

#### RECENT TECHNOLOGY:

The more common types of sunscreen are lotions, creams, gels, sprays, sticks, and oils. More photo-stable and effective sunscreen products using nanoparticles, microsponges, microspheres, dendrimers, and liposomes recently hit the market. Sunscreens are no longer a unique cosmetic, as there are now many other photo-protective chemicals added cosmetics in hair care (such as shampoo), skin care (such as moisturisers, foundations, and concealers), lip care (such as lipsticks, lip balms), and even eye care (such as eye creams) that have more than 30 SPF available on the market.

#### CONCLUSION:

Thus, it can be said that there is a large market for sunscreen chemicals, whether they are synthetic, natural, or a combination of both, due to the awareness of the need for protection from harmful UVA and UVB rays. Although a photo-stable, uniform UVA/UVB protective sunscreen product with a high SPF can be the ideal minimum requirement, natural chemicals such as polyphenols (flavonoids, tannins), carotenoids, anthocyanidins, a few vitamins, fixed oils and volatile oils from vegetables, fruits, medicinal plant parts (leaves, flowers, fruits, berries), algae, and lichens are more effective due to their long-term beneficial effects, especially against free radical generated skin damages.

**ABBREVIATION USED:**UVA stands for ultraviolet A radiation, UVB for ultraviolet B radiation, UVC for ultraviolet C radiation, and IPD for immediate pigment darkening and PPD for persistent pigment darkening. UV protection factor (UPF); The acronyms SPF, PFA, IPF, MED, COLIPA, and ISO stand for Sunburn Protection Factor, Protection Factor UVA, Immune Protection Factor, Minimal Erythral Dose, and International Organization for Standardization.

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