

## Role of Natural Herbs in Sunburn: A Review Report

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Received: 25-04-2023 / Revised: 12-05-2023 / Accepted: 17-06-2023

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Conflict of interest: Nil

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### Abstract

Herbs have been utilized for ages in both medicine and cosmetics. It is commonly recognized that they have the ability to beautify, cure, and improve a variety of skin conditions. There is a constant need for UV radiation protection and avoidance since ultraviolet (UV) radiation can result in sunburns, wrinkles, lowered immunity against infections, accelerated ageing, and cancer by their negative impacts. Herbs and herbal products have a high potential primarily because of their antioxidant properties. The major function of antioxidants, which include vitamins (vitamin C, vitamin E), flavonoids, and phenolic acids, is to fight against free radical species, which are the primary cause of a number of undesirable skin changes. Despite the considerable potential for skin protection offered by isolated plant chemicals, entire herb extracts displayed superior potential because of their intricate structure.

Numerous studies have demonstrated that the polyphenols in green and black tea reduce the negative effects of UV exposure on the skin. Aloe gel is thought to stimulate skin and aid in the development of new cells. According to spectrophotometer tests, a concentrated extract of *Krameria triandra* absorbs 25 to 30% of the UV radiation that octyl methoxycinnamate normally absorbs. Coconut, peanut, olive, and cottonseed oils only block off roughly 20% of UV radiation, compared to sesame oil's 30% UV resistance. The result of the interaction between naphthoquinone and keratin is a "sclerojuglonic" molecule, which offers UV defiance. Research and the development of new cosmetic trends are based on the traditional uses of plants in medicine and beautification.

**Keywords:** Antioxidants, cosmetics, plant extract, sunblock's, Ultra violet radiation.

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### Introduction

The market for sunscreen products has seen tremendous growth recently.

However, the motivation for their creation has changed. People wanted to tan beautifully quickly and effortlessly at first, without the danger of burning. These days, everyone must use sunscreen lotions to protect themselves from ultraviolet (UV) radiation. This review examines the potential of herbs as radioprotective agents and its prospects in all pertinent areas.

Ultraviolet light

Infrared radiation (IR), visible light (VIS), and ultraviolet radiation (UV) are the three main categories of electromagnetic radiation. IR radiation, which is invisible to the human eye, includes heat. The general lighting wavelength range is called VIS. In terms of decreasing wavelength and rising energy, UV radiation is separated into three distinct bands: UVA (320–400 nm), UVB (290–320 nm), and UVC (200–290 nm). diverse UV radiation wavelengths and

energy levels have distinctly diverse impacts on biological tissue. [1]

#### Ultraviolet C rays

Although UVC contains the most energy and the greatest potential for biological damage, it is efficiently filtered by the ozone layer and is not thought to have a role in human exposure to the sun [1] because of this biologically significant. [2]

#### The ultraviolet B spectrum

Latitude, altitude, season, time of day, cloud cover, and ozone layer all have an impact on how much solar UVB and UVA energy reaches the earth's surface. The equator and higher elevations have the most irradiation. UVA to UVB exposure on Earth's surface is 20 to 1. The peak time for UV radiation is between 10 and 4. pm. [3] 3.5% UVB and 96.5% UVA make up the UV spectrum that reaches the earth's surface on a summer day. The main effects of UVB include erythema and sunburn. Both photo carcinogenesis and immunosuppression may result from it. [1]

#### Ultraviolet an emission

With a longer wavelength than UVB, UVA is less impacted by altitude and atmospheric factors. When compared to UVB, UVA may reach the skin more deeply and is unaffected by window glass [1, 3]. According to estimates, 50% of UVA exposure takes place in the shade. [3,4] It is more effective at causing instant and delayed pigment darkening and delayed tanning than it is at causing erythema, in

contrast to UVB. Significant negative consequences of UVA include immunosuppression, photoaging, and skin cancer and eye damage. [5-9]

UVA rays are advantageous because they stimulate the formation of vitamin D3 by irradiating 7-dihydrocholesterol. They accelerate the tan-promoting darkening of preformed melanin pigment.

Contrarily, it has been shown that these rays cause photosensitivity, which leads to a variety of allergic reactions and actinic lesions. [10]

Effects of UV radiation that cause damage: Erythema, oedema, and pigment darkening are some of the acute effects of UVB radiation on human skin. These are followed by delayed tanning, thickening of the epidermis and dermis, and the production of vitamin D. Chronic UVB effects include photoaging, immunosuppression, and photo carcinogenesis. [3,11] In fair-skinned and older people, UVB-induced erythema appears about 4 hours after exposure, peaks between 8 and 24 hours later, and then gradually declines over a day or two. Individuals may experience UVB erythema that is persistent, occasionally persisting for weeks. [3,12] With longer wavelengths, the ability of UV to cause erythema rapidly decreases; in comparison to UVB, UVA requires around 1 000 times more exposure to elicit the same erythematous response.[2,3,13,14]



Figure 1: Damage effects of UV Radiations [44]

Both tanning and UVA-induced erythema have biphasic temporal histories. Erythema is frequently present right away following the end of the irradiation period, [3,15] decreases over the course of several hours, and is then followed by a delayed erythema that begins at 6 hours and peaks at 24 hours. [3,15-18] Both UVA and UVB have nearly identical action spectra, however UVA is more effective at causing tanning while UVB is more effective in causing erythema. [3,19]

Use skin care products with UV protection to diminish or completely suppress UV radiation's negative effects. As a result, UV protection becomes a crucial component of more and more cosmetic compositions. In cosmetics, which has led to the development and marketing of an increasing number of items. Future medicine usage is anticipated to be surpassed by that of body and cosmetic care products. Natural cosmetics appear to hold the promise of the future for a sizable portion of the global population. [20]

Dermo cosmetic preparations, often known as cosmetics, are used to protect, clean, and care for the skin. They come into contact with the mouth and teeth, as well as the skin, hair, nails, lips, and external sexual organs of humans. They maintain them in the proper condition, clean, perfume, alter their appearance, and/or make any necessary odour corrections. UV-protective skin care products are a component of cosmetics. [21] As a result, businesses create products with extra Consider the ingredients when developing products that can make claims about their ability to reduce wrinkles or to regulate oil. Today, adding sun protection to foundations and lipsticks is another approach to increase the value of these products for consumers. This offers all-around defence against the negative effects of UV radiation. For sunscreen actives, there are numerous laws and restrictions. Under cosmetics and drug laws, the Food and Drug Administration in the USA controls the sales of colour cosmetics including sunscreen. Similar to cosmetics, sunscreen products are governed throughout Europe. The EEC's

trade association, COLIPA, collaborates with national regulatory bodies to create legislation. Contrary to other EEC nations, France and Italy mandate the labelling of the active substances and concentration contained in finished products. [22]

#### **Sun protection items: -**

There are many various kinds of sunscreen products available on the global market, including oils, sticks, gels, creams, and lotions. Each of them must wear sunscreen that offers sufficient protection from UVA and UVB rays.

Chemical and physical sunscreens are the two main categories. While a chemical sunscreen absorbs UV rays, a physical sunscreen reflects them away from the skin, acting as a temporary layer of protection. [23]

#### **Physical sun protection**

The two most commonly used physical sunblock's are titanium dioxide and zinc oxide. Both offer comprehensive UVA and UVB protection. They are mild enough for daily use. Because they rarely cause skin irritation, they are especially suitable for children and those with delicate skin. However, because of the scattering effect, they frequently result in the so-called "whitening" phenomena when applied to the skin, which negatively impacts the appearance and effectiveness of sunscreen products. [22-24]

#### **Synthetic sunblock's: -**

Most substances only completely block a small portion of the UV spectrum.

Because each molecule blocks a particular region of UV light, the majority of chemical sunblock's are made up of many compounds. The majority of the compounds in sunblock's are UVB-active.

The UVA area is blocked by only a few substances. The sunscreen that combines both chemical and physical active components is the finest. Dermatologists frequently advise using sunblock's that contain avobenzone (Parsol® 1789) or a physical blocker. with other compounds. Avobenzone and physical sunscreens cannot be combined, though, in the USA.

Avobenzone has reportedly been found to be unstable in formulations containing physical sunscreens. It has occasionally been observed that covering the surface of a pigment increases its durability. [25]

In beach and skin care products with sun protection factor (SPF), whitening is unacceptable. It is challenging to develop beautiful formulas that are effective in blocking dangerous UVA/B radiation.

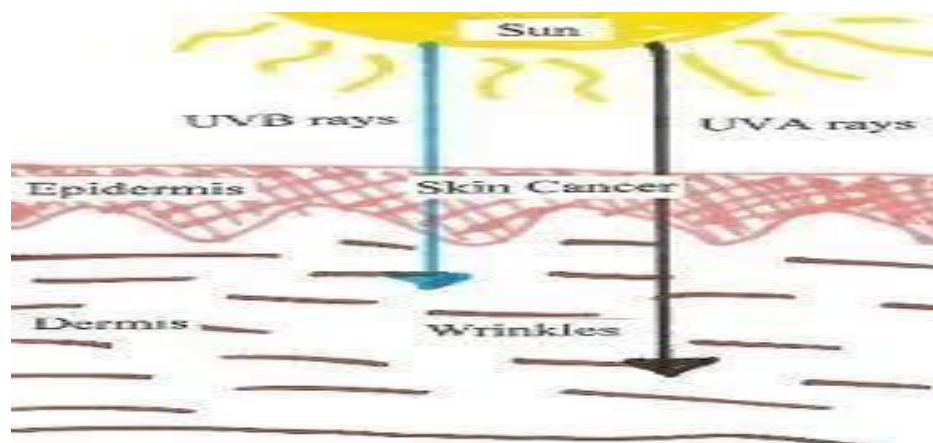
Iron oxides and titanium dioxide with increased scattering power can now be used in foundations to provide broad-spectrum protection. [22] Numerous organic compounds that are frequently included in sunscreen lotions have not been deemed safe for extended human usage. For instance, sunscreens containing zinc oxide and titanium dioxide are marketed on the grounds that they may be possible safer alternative to organic sunscreen absorbers. But there are also no long-term safety data for the usage of microfine titanium dioxide as a sunscreen product. [26] Many different natural ingredients are being used by

manufacturers to protect skin from UV rays. The natural UV absorbers included in these goods, like squalene, peptides, and nucleotides, have been shielding mammalian skin for over a hundred million years. [27].

these results. Effective botanical antioxidants such as tocopherols, flavonoids, phenolic acids, nitrogen-containing chemicals (indoles, alkaloids, amines, and amino acids), and monoterpenes are frequently employed in traditional medicine.

Applying aromatherapy formulations rich in antioxidants presents intriguing study opportunities because it has been demonstrated that topical antioxidant supplementation affects the skin's antioxidant network. [28]

The next step was to examine different traditional treatments, analyse the ethnopharmacy of many nations, and apply our understanding to identify compounds that might be responsible for the positive effects on the skin. There is still a tonne of undiscovered active molecules after the numerous ones that have already been found. [29]



**Figure 2: Sun exposure and the damaging effects (45)**

### Natural sunscreens

The natural sun protection proteins in the skin are called Nucleotides, peptide linkages, and lipids are all absorbed. The peptide bonds in the proteins of the skin are safeguarded by the high quantity of plant peptides. Some products' high squalene (from olive oil) content safeguards the skin's delicate lipids. The most vital lipid for the skin's protection is squalene. A nucleotide

called allantoin, which is present in the body naturally, absorbs the UV rays that can harm cells' delicate DNA. Comfrey plant extract allantoin is utilised for its anti-inflammatory, relaxing, and healing qualities. Because of its capacity to aid in the healing of minor wounds and encourage healthy skin, this extract can be found in anti-acne treatments, sun care products, and clarifying lotions. [30]

**Herbal Composites: -**

The usage of natural antioxidants in commercial skin care products is rising as a result of research into plant-derived products' antioxidant activity in the search for efficient topical photoprotective agents. Currently, we examine the chemical makeup of herbal treatments to determine what, chemically and pharmacologically is better suitable.

**Resveratrol**

The group of polyphenolic chemicals known as stilbenes includes resveratrol. Resveratrol, a fat-soluble substance found in a variety of plants, *cis* and *trans* isomers. Resveratrol is a polyphenolic phytoalexin that occurs naturally. [31] Resveratrol was discovered to mediate anti-inflammatory actions, drive human promyelocytic leukaemia cell differentiation, and act as an antioxidant and antimutagen. Additionally, it prevented carcinogenesis in a mouse skin cancer model and the growth of preneoplastic lesions in cultured mouse mammary glands exposed to carcinogens. [32] Prior to UVB exposure, SKH-1 hairless mice treated topically with resveratrol showed a significant reduction in UVB-generation of H<sub>2</sub>O<sub>2</sub>, infiltration of leukocytes, and suppression of skin oedema. Long-term research has shown that topical resveratrol application (both *re-* and *post-*treatment) has the effect of reducing the incidence of UVB-induced tumours and delaying the start of skin carcinogenesis. [33]

Only a few foods—grapes, wine, grape juice, cranberries, cranberry juice, peanuts, and peanut products—are known to contain resveratrol. [34] [Table 1]. The roots of the weed *Polygonum cuspidatum* are one of the richest sources of resveratrol, according to research by Vastano et al. (2 960-3 770 ppm). Additionally, *Veratrum grandiflorum* leaves and

*Veratrum formosanum* roots and rhizomes have been found to contain high concentrations of resveratrol.

Due to their medicinal benefits (laxative, anti-arteriosclerosis, anticancer), these final

three herbs have been widely employed in Chinese and Japanese folk medicine. [47,51] Quercetin

The flavanol quercetin is the most prevalent in the diet. [52] Quercetin possesses antioxidant and anti-inflammatory properties, and modulate the immune system.[53] A diet high in quercetin has been shown to prevent the growth of carcinogen-induced rat mammary cancer, colonic neoplasia, oral carcinogenesis, and the development of skin tumours in three mouse models of skin carcinogenesis when applied topically.[57] The protective effects of dietary fruits and vegetables [Table 1] against mutagens and carcinogens, particularly metals, may be due to quercetin.[58] It can be found in a variety of common fruits, vegetables, drinks, and herbs.[59] Onion has the highest amounts.[52] Testing on humans revealed quercetin and rutin to be possible topical sunscreen ingredients that offer UVA and UVB protection.[60]

**Apigenin**

A common plant flavonoid called apigenin can be found in herbs, fruit, vegetables, and beverages [Table 1]. In SKH-1 mice, apigenin was reported to be efficacious in preventing UVA/UVB-induced skin carcinogenesis. [59] Although apigenin did not prevent NF- $\kappa$ B from translocating into the nucleus, it did prevent the activation of reporter genes activated by NF- $\kappa$ B. [61] In the mouse ear test, it was demonstrated that apigenin and other flavonoids were responsible for the action in marigold (*Calendula officinalis*), and that apigenin was more effective than indomethacin. *Artemisia* (*Artemisia inculta*) and *Cuminum cyminum* or cumin also contain apigenin and luteolin and their derivatives in addition to plants like carrot (*Daucus carota*), agrimony (*Agrimonia eupatoria*), arnica (*Arnica montana*), purple coneflower (*Echinacea purpurea*), and eyebright (*Euphrasia officinalis*) --all of which have demonstrated anti-inflammatory activity when used under the right conditions. [62]

**Silymarin**

A flavonoid known as silymarin is found in milk thistle (*Silybum marianum*) seeds [63] [Table 1]. Silybin, silidianin, and silicristin are the three phytochemicals that make up silymarin.

The most effective phytochemical is silybin. [31] It has been demonstrated that topical silymarin has an exceptional anticancer effect. The number of tumours that UVB light- induced in the skin of hairless mice was reduced by 92%. Silymarin decreased the development and apoptosis of UV-induced sunburn cells. The outcome was unrelated to the action of sunscreen, and an antioxidant mechanism might be to blame. [35] In vivo, silymarin therapy reduces immunological suppression and oxidative stress brought on by UVB exposure. [36]

### Curcumin

The rhizome of turmeric (*Curcuma longa*) contains the yellow, odourless pigment known as curcumin (diferuloylmethane) [Table 1]. Curcumin has anti-inflammatory, antitumoral, and antioxidant properties. It has been discovered that topical administration of curcumin significantly reduced UVA-induced ornithine decarboxylase (ODC) activity in the epidermis of CD-1 mice.

The capacity of curcumin to scavenge reactive oxygen species (ROS) was thought to be the cause of its inhibitory effects.

In human epidermoid carcinoma A431 cells, curcumin can stop UV radiation from causing apoptosis. [37]

**Table 1: Natural Substances for Skin Protection**

Active agent	Natural sources	Effects
Resveratrol	Grapes, wine, grape juice, peanuts,	Antioxidant, antimutagenic
Quercetin	Evening primrose ( <i>Oenothera biennis</i> ), mayapple ( <i>Podophyllum peltatum</i> )	Anti-inflammatory, antioxidant, immunomodulator
Apigenin	Citrus fruit, peppermint, lemon, horsetail, yarrow, parsley,	Prevention of UVA/UVB-induced skin carcinogenesis,
Silymarin	Milk thistle ( <i>Silybum marianum</i> )	Antitumor
Curcumin	Turmeric ( <i>Curcuma longa</i> )	Anti-inflammatory, antitumoral, antioxidative

### Vitamin E

The anti-oxidant vitamin E (-tocopherol) may shield the cell membranes of both plants and animals from harm caused by light. [38] These antioxidants have been demonstrated to lessen both acute and chronic photodamage when applied topically to the skin. Only the naturally occurring forms of vitamin E, alpha-tocopherol and tocotrienol, have the ability to significantly diminish skin roughness, the width and depth of wrinkles when administered topically. [39] The stratum corneum becomes more hydrated and has a

greater capacity to bind water when vitamin E is administered topically. The destructive collagen-destroying enzyme collagenase, which sadly rises in ageing skin, is lessened by alpha-tocopherol. [40] In addition to being an emollient, vitamin E is a free radical scavenger. [41]

### Vitamin C ascorbic acid

The most significant internal and extracellular aqueous-phase antioxidant in the body is vitamin C (L-ascorbic acid). The skin advantages of vitamin C are numerous, with the most significant enhanced collagen production and

photoprotection. The anti-inflammatory effects of vitamin C improve photoprotection.

Long-term photoprotection enables the skin to repair prior photodamage; collagen production and MMP-1 suppression have been shown to reduce wrinkles; and tyrosinase inhibition and anti-inflammatory activities depigment solar lentigines. [41] Rosehip seed oil or extract contains significant amounts of active vitamin C. [42]

### **Use of Whole Herbal Extracts**

Whole herbal extracts contain a variety of substances that improve the impact on the skin when combined. One herbal extract may possess anti-aging, anti-mutagenic, anti-inflammatory, emollient, melanin-inhibiting, and antioxidant effects.

#### **Black and green tea**

The majority of individuals keep tea in their kitchen. In many homes, tea (*Camellia sinensis*) is used as a solution for sunburn. The Chinese advise rubbing cooled black tea into sunburned skin. One claims that theobromine and tannic acid in tea aid soothe sunburns. Catechins, another group of molecules found in tea, protect against and treat skin damage and may even lessen the risk of skin cancer caused by radiation and chemicals. [43]

#### **Aloe-vera**

Aloe Vera, scientifically known as *Aloe barbadensis*, has been studied. proven for all types of burn, including thermal, solar, and radiation damage. It has also been proven that using it before, during, and after these skin-damaging events has a preventive impact. Obviously, the plant's calming and cooling properties are its principal uses; nevertheless, if employed at less than 50%, the plant is ineffective.

### **Conclusion**

Skin injury is caused by UV radiation. Everyone requires defence the dangers of UV light. Our skin can be protected in a variety of ways. Avoiding direct sun exposure is the best strategy. But occasionally, especially during the heat, it may be impossible. Sunscreen products ought to be used as a result. Customers want high-quality goods at reasonable prices. When people use these items, it indicates that they wish to obtain everything. One and only: UV radiation protection, anti-aging and wrinkle reduction, cooling and moisturising benefits on the skin without causing an allergic reaction, and skin colouring effects. The primary directive for scientists and researchers is this request. Additionally, they are aware that certain chemical substances might injure skin. As a result, people increasingly opt for items made of natural ingredients.

Today, it's fairly common to find natural ingredients in many skin care products. The primary cause of that is plants' capacity to defend themselves against UV radiation from the sun. Plants may be a great resource for us. One potential solution for preventing the damaging effects of UV radiation on the skin is plant phenolics.

There are numerous different compounds found in plants that can be helpful for skin care. They have yet to reach their full potential. However, more clinical studies and research trials are required.

It has been demonstrated that employing just one natural ingredient is insufficient for skin protection. Perhaps combining a number of different organic compounds is the best course of action.

were reported in females with age ranged from 48 years to 72 years (mean age 56.67



years) and presented with abdominal pain, weight loss and anemia.

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