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A Review on Herbal Sunscreen

Narhare Vaibhavi Tukaram[1], Nangare Mahesh Kailash[2], Kalekar VaishalDhananjay[3], Neha Mahadev Jadhav[4], Jadhav Sumit Rajabhau[5], Jadhav Vaishnavi Sachin[6]
Student, Shivlingeshwar College of Pharmacy, Latur, India[123456]

Abstract: *Natural compounds derived from plants have been explored as possible sunscreen ingredients because of their strong antioxidant and UV radiation absorption capabilities. Sunscreens may lower the risk of sun-induced skin cancer by reducing the amount of UV radiation that reaches the skin. With a lower concentration of chemical UV filters, the current study aims to create sunscreen lotions with a broad spectrum of anti-UV radiation efficiency.Sun Protection Factor (SPF) was used to assess the product's efficacy. Alpinia galanga is a key ingredient in many commercial sunscreen lotions because it has skin-protecting properties against UV rays and increases the activity of conventional sunscreens. Curcumin was chosen as a potential bioactive agent because of its phytochemical compositions, which contain a significant amount of polyphenolic compounds. The findings demonstrated that the sunscreen lotions had SPF for normal skin and were stable, non-irritating, and non-mutagenic. When tested using a standard, the effectiveness was shown to be equivalent to that of a sunscreen that is sold with SPF 20 and SPF 55. Comparing formulation F2 with curcumin extract to F1 and F3, the current investigation showed that it was stable, effective, and had a higher SPF.*

Keywords: Skin burn, Bioactive product, Aloe vera, Carrot seed oil, SPF

I. INTRODUCTION

Sunblocks are used to shield the skin from the sun's damaging rays, which can cause erythema in the short term and actinic photoaging and skin cancer in the long run. Sunscreens may lower the risk of sun-induced skin cancer by reducing the amount of UV radiation that reaches the skin. Based on wavelength, the UV spectrum is separated into three groups: UVA (320–400 nm), UVB (290–320 nm), and UVC (100–290 nm). UVA2 (320– 340 nm) and UVA1 (340–400 nm) are further classified into UVA. SolaAbout 90–99% of the UV light that reaches the Earth's surface is UVA, and the remaining 10% is UVB (COLIPA 2006; Verschooten et al. 2006; Faurschou and Wulf 2007). Recently, sunscreens with broad spectrum anti-UV radiation effectiveness and lower concentrations of chemical UV filters have been developed (Velasco et al. 2008); bioactive products have been the subject of numerous studies because of their safe use, minimal environmental impact, and ecological concerns (sustainability) (Banov et al. 2006; Rolim et al. 2006). A variety of artificial substances are employed.

One well-known and traditional medicinal plant in the Liliaceae family is aloe vera. It is a pea-green perennial xerophytic succulent that can be shrubby or arborescent. Extracts from aloe vera leaves include a large number of polyphenolic compounds and components. Vitamin supplements, minerals, carbohydrates, enzymes, lignin, saponins, salicylic acids, and amino acids are among the 75 potentially active components of aloe vera. Both first- and second-degree sunburns have been successfully treated with it. It has been discovered that aloe vera gel shields human skin against all of the negative effects of radiation. Aloe vera has long been used to treat skin injuries (burns, wounds, insect bites, and eczemas) and digestive problems because of its anti-inflammatory, antibacterial, and wound-healing properties.

as photoprotectives, however due to their possible toxicity to humans and capacity to disrupt certain pathways of the multistage carcinogenesis process, their usage is restricted. Due to its ability to shield the skin from both endogenous and external hazardous agents and to assist treat a variety of skin disorders, phytoconstituents are becoming more and more popular as ingredients in cosmetic formulations (Aburjai and Natsheh 2003). When applied to these areas, herbal extracts have rejuvenating, healing, softening, and sunscreening properties (Deep and Saraf 2008). Numerous botanical substances have demonstrated antimutagenic, anticarcinogenic, and nontoxic properties. They can also significantly

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block a wide range of cellular processes at different stages of carcinogenesis. Tea polyphenols, curcumin, silymarin, garlic compounds, apigenin, resveratrol, ginkgo biloba, and beta-carotene are a few examples. Ascorbic acid and beta-carotenoids (F'guyer et al., 20033). Phenolic acids, flavonoids, and high molecular weight polyphenols are significant groups of advantageous phytoconstituents (Robbins 2003; King and Young 1999). Aloe vera, basil, green tea, almond, olive, jojoba, cucumber, and basil are the most often used plants in herbal sunscreen lotions (Katiyar and Elment 2002; Ashawat et al. 2006; Ashawat et al. 2005; Shrivastava et al. 2003). Regarding the creation of sunscreens, the use of natural raw ingredients that provide UV absorption and skin protection against UVB and UVA radiation is very desirable since it is linked to the products' advantages and customer compliance (Tabrizi et al. 2003). Numerous pharmacological characteristics, including antiallergic, anti-inflammatory, hepatoprotective, vasoactive, antithrombotic, antioxidant, and free radical, are displayed by polyphenolic compounds.

due to their distinct in vivo action mechanisms, including scavenging, anticancer, antibacterial, and antiprotozoa (Movileanu et al. 2000; Baby et al. 2006). In addition to their antioxidant and absorbance spectrum characteristics, polyphenolic substances like flavonoids and organic UV filters may also have photoprotective properties because of their structural similarities (Velasco et al. 2008). With a lower concentration of chemical UV filt, the current study aims to create sunscreen lotions with a broad spectrum of anti-UV radiation efficiency.

The effectiveness of the products were evaluated through various physicochemical properties and biological activities;the major being Sun Protection Factor (SPF). Curcumin wasselected as potential bioactive agents due to their phytochemical composition possessing considerable content ofpolyphenolic compounds and Alpinia galanga is used askey ingredient in various commercial sunscreen lotions as having skin protectant action against UV rays and boosts the activity of conventional sunscreens.

Herbal sunscreens have the following benefits:

- accessibility.
- No adverse effects.
- No specialised tools are required for setup.
- Resources that are renewable.
- It is easy to find botanical components.
- They are affordable.

II. SUN PROTECTION

UV radiation exposure is the primary cause of skin cancer and contributes to ageing skin, it is imperative to protect the skin and eyes from the sun's harmful effects. Certain individuals may require extra caution due to photosensitivity. In any season, you should also take precautions to protect your skin when you are at high altitude, especially in the snow, as it reflects more UV rays onto your skin. All forms of light originate from the electromagnetic wave that is sunlight. Sunlight on the surface of the Earth is composed of various spectrums, including visible light (400-760 am), ultraviolet (UV) A, and infrared light (>760 nm). UVB radiation (290-315 nm), 315-400 nm. Additionally, UVC light (100– 290 nm) is extremely dangerous, highly energetic, and carcinogenic. Because of the ozone layer's protection, only a small percentage of sunlight that reaches the Earth is UVA, with the remaining minuscule portion being UVB. The primary cause of skin damage is UV radiation. particularly facultative skin colour (FSC), a skin tone impacted by hormones and UV radiation, as a result of environmental factors. Melanogenic is the skin's natural defence against more UV damage and happens when the skin is exposed to UV light. Sunlight-induced darkening of the skin is a protective mechanism for the muscles, preventing DNA alterations and the development of skin cancer. 1. Therefore, efforts must be made to safeguard the skin, which serves as the outermost barrier of the body. Among them is the application of sunscreen. Since antioxidants are photoprotective, phenolic compounds can function as sunscreens to prevent the damaging effects of UV radiation on the skin. Another study that found antioxidant chemicals are inhibitors utilised to prevent autoxidation supports this. Phenolic chemicals have an antioxidant impact because of their oxidising qualities, which help to counteract free radicals. Physical and chemical sunscreens are the two main categories of sunscreen products that are generally recognised.

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Comparing Chemical and Physical Sunscreens made by synthetic chemicals have the following characteristics: They are strong UV absorbers that stay relatively stable after absorbing radiation. These sun filters are made with additional ingredients to provide extremely efficient products with protection factors ranging from 4 to 30. Crucially, they frequently need to be reapplied rather frequently.

Sunscreens in physical form include inert mineral particles that act as a mirror to reflect UV light. Ultra fine titanium dioxide (TiO2), which is composed of tiny particles that are just 20–30 mm^3 in size, is the most often utilised form. The fact that these products are inert materials that do not degrade over time gives them an edge over chemical sunscreens. Because they are insoluble particles that are not absorbed through the skin, they are much less likely to irritate the skin. Modern physical sunscreens deflect UVB and short UVA radiation better than previous formulations because of the tiny size of the particles.

The mathematical formula of sunscreen:

$CF\sum EE(\lambda) \times I(\lambda) \times A(\lambda)$

In contrast, CF stands for correction factor, EE for erythemogenic effect, I for wavelength-specific solar light intensity, and A for absorbance. The DPPH Method for Determining Antioxidant Activity in Vitro Ascorbic acid as a standard and 1 ml of herbal sunscreens in various doses were taken in separate vials. After adding 5 mL of DPPH methanolic solution and giving it a good shake, it was incubated for 20 minutes at 370C. Methanol was used as a blank to determine the absorbance at 516 nm. As a control, the DPPH absorbance was employed [24]. The percentage of antiradical activity was calculated using the formula below: $\% \ Anti - radmimulabsrrbrus - Samlemmeesabsorrbarcccs Controlabsorbance \times 100$ (4) Occlusion Studies in Vitro When the entire surface of the skin is covered, this is known as skin occlusion.

III. MATERIAL AND METHOD

1) Carrot seed oil

- Because of its advantageous qualities for skin health and sun protection, carrot seed oil is a typical natural element in herbal sunscreen.
- Beta-carotene, a precursor of vitamin A that has antioxidant qualities and aids in skin regeneration, is abundant in caretenoids.
- It is thought that carrot seed oil has a built-in SPF.
- Drinking enough water Maintain skin hydration to avoid dryness brought on by extended contact to SAN
- Carrot seed oil adds a gentle and skin-friendly ingredient to herbal sunscreen, which enhances other natural san protection products.

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2) Rice water

- A growing number of natural and herbal skincare products, such as sunscreen, include rice water as a component.
- Ferulic acid, an antioxidant found in rice water, is well-known for its capacity to absorb UV rays and stop oxidative damage brought on by exposure to the sun.
- It lowers the risk of premature ageing, hyperpigmentation, and photodamage by assisting in the neutralisation of free radicals produced by ultraviolet radiation.
- Rice water's carbohydrates and amino acids make it a great way to soothe sunburnt or irritated skin.
- Although rice water improves skin health and offers some defence against UVA rays, it cannot take the place of conventional sunscreen with an SPF that has been scientifically verified.

3) Rose water

- Because of its calming, moisturising, and antioxidant qualities, rose water is a popular natural element in herbal sunscreen formulations.
- Made from rose petals that have been steam-distilled.
- Although it doesn't offer direct sun protection, rose water improves skin health and hydration.
- For a good sunscreen composition, it needs to be combined with UV blocking substances such zine oxide.
- Herbal sunscreen frequently uses rose water as a nourishing and moisturising basis.

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4) Glycerine

- One common element in herbal and natural skincare products, such as sunscreen, is glycerin.
- This humectant, which comes from natural sources like plant oils, is essential for preserving skin hydrated and improving the overall efficacy of sunscreen formulation.
- The characteristics of glycerin nutritious, calming, and humectant.Water-soluble, natural, and non-comedogenic.

5) Cetyl alcohol

Cetyl alcohol is a multipurpose component that is frequently included in herbal sunscreen and other skin care products Cetyl alcohol doesn't dry things out. Alcohols that are irritating, such as ethanol and isopropyl alcohol Cetyl alcohol's characteristics Emollient, stabiliser, thickening agent, and non-comedogenic.plant-based The sunscreen's smooth, creamy consistency, which comes from cetyl alcohol, makes it simple to apply

It functions as an emollient to preserve the skin's natural hydration barrier and help seal in moisture.

avoiding the dryness brought on by the sun.

Cetyl alcohol aids in the mixing of water and oil, which is essential in formulations that contain substances with protective oil and hydrating water bases.

Formulation table of sunscreen

Ingredients	Quantity	Uses
Carrot seed oil	20gm	Absorb UV light
Rice water	20gm	Sun protection
Rose water	5gm	Antioxidant
Cetyl alcohol	2-3gm	Thickening agent
Glycerine	5-10gm	Spreadibility, de-tanning
Propylene glycol	2-5 gm	Humectant
Sodium benzoate	0.001gm	Preservative

IV. EQUIPMENT USED IN SUNSCREEN

- A digital pH meter
- Test chamber for the environment
- The autoclave
- The Brookefield viscometer
- The incubator

V. PROCEDURE

- Put 5 grammes of rose water into a measuring cylinder with 20 grammes of rice water.
- After cleaning and Sterlizing a mortal pestle, add the aforementioned mixture to it and triturate it in a circular motion.

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- Add two to three grammes of cetyl alcohol while stirring constantly.
- Now, while swirling constantly, add 5–10 grammes of glycerin and 2–5 grammes of propylene glycol.
- After a while of continuous stirring, add 20 grammes of carrot seed oil and whisk once more.
- Add 0.001g of sodium benzoate, the preservative, stir for a while, and then store in a closed container.

VI. EVALUATION TEST OF HERBAL SUNSCREEN

- Assessment of the Herbal Screen Physical characteristics
- Test of spreadability
- Stability of heat
- The irritability test
- Microbiological examination
- Consistency test
- Viscosity determination
- Test of stability
- The pH test
- SPF Determination

Physical characteristics

- **Colour**: To ascertain our sunscreen's colour In diffuse daylight, 0.2g of the substance was set on a white background and observed by the human eye.
- **Odour:** 0.4g of the chemical was put in a 5-diameter watch glass, left for 15 minutes, and then the sample was slowly and repeatedly breathed to determine the compound's scent. Depending on the formulation and any additional scent, sunscreens can have a wide range of smells.

Test of spreadability

The therapeutic efficacy of herbal sunscreens was assessed by their spreadability. Between two slides, the recommended amount of herbal sunscreen was applied, and the two sides required the allotted number of seconds to slide off. Spreability was described as the speed at which two slides could be separated.

Stability

Heat is required to evaluate the stability of the sunscreen expression at higher temperatures. It helps determine the sunscreen’s shelf life and therapeutic efficacy. In order to determine what temperature the product declines at, we shall raise the temperature to a predetermined level in this test.

pH Test

The right pH should be measured in order to optimise sunscreen’s stability and expression. To measure the pH in a buffer, dissolve 0.5 g of lotion in 50 ml of distilled water. The pH of the sunscreen can then be determined by observing the colour of the pH paper. This procedure is carried out frequently, and the results will be confirmed more than twice. If there are any differences, they should be stated.

The Irritation Test

The majority of tests are irritability tests to prevent irritation of any kind. On the left-hand dorsal surface, mark a space of one square centimetre for this test. After applying the lotion to the designated region, the time was recorded. Erythema, oedema, and irritation were monitored for up to 24 hours at regular intervals and reported.

SPF determination

Using a UV Visible Spectrophotometer, the effectiveness of herbal sunscreens was investigated in vitro. A solution of 0.050 g of herbal sunscreen creams in 50.0 ml of ethanol was prepared, yielding a 0.10 percent (w/v) solution. Each herbal sunscreen’s aliquots were scanned at 5-nm intervals between 290 and 320 nm.

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VII. CONCLUSION

Research on herbal sunscreen highlights its potential as a natural and efficient substitute for conventional synthetic sunscreen. A potential area of innovation in the sun care industry is herbal sunscreen, which combines natural ingredients with effective sun protection. Despite this, they offer numerous benefits, like promoting skin health and being environmentally friendly. Texture, SPF efficacy, and formulation complexity are among the problems that must be fixed. Customers looking for natural and sustainable sun protection may choose herbal sunscreens as a result of developments in product development and ingredient research. The creation of more potent and aesthetically pleasing herbal sunscreens could promote wider acceptability and offer a competitive alternative to synthetic options as the demand for organic and environmentally friendly products grows.

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