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Research Article

Preparation and Evalution of Sunscreen Cream

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ABSTRACT

Nowadays, herbal sunscreens are used all over the world for protection against UV rays from the sun. Sunscreen is a topical medication that helps shield the skin by either absorbing or reflecting the sun's UV radiation. Herbal treatments are safer and have fewer side effects. Formulating and testing sunscreen cream with anti-inflammatory and anti-ultraviolet properties is the goal of this project. The usage of screening agents, which have been found to be effective in lowering symptoms, has increased due to the increasing incidence of skin cancers and UV radiation's photodamaging effects. Skin is protected from UV rays and numerous infections by the plant's antibacterial, anti-oxidant anti-inflammatory and antiseptic qualities. Sun screening agents should reduce symptoms of skin cancer and photo-damage caused by UV exposure. Herbal sunscreen creams have been evaluated for their organoleptic properties, rancidity, pH, spread ability, and drug content. Sun Protection Factor (SPF) was employed to assess product efficacy. These products displayed great spread ability, regularity, normalcy, admire, ease of removal, desired pH, and no indication of phase separation. Sunscreens should be pleasant, chemically stable, mild on skin, non-hazardous, resistance to deterioration from direct sunlight, and effective in protecting against sun damage. Sunscreen creams are excellent for softening, repairing, and regenerating the skin.

INTRODUCTION

Sunscreen is becoming among the most popular personal care products because of its many benefits for skin health. Sunscreens are available independently as well as in combination with other personal care products for the skin, lips, hair, eyes and immune system. Despite providing us with vitality, the sun can harm our skin. The ultraviolet (UV) rays of sunlight can causes sunburn, skin cancer, skin pigmentation, tan, premature lines, folds, wrinkles and premature skin ageing. By blocking UV rays from entering the skin, sunscreens protect it from these harmful effects. The ideal sunscreen is one that is safe, effective, and affordable. It should also have a high Sun

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Protection Factor (SPF) to provide the best UV protection. Plant compounds are being studied as potential active components due to their perceived safety and acceptance by the public. Natural sunscreens with high UV absorption are limited by their low specific extinction value and difficulty spreading in large-scale cosmetic applications. Sunscreens are the finest alternative protection against UV irritants. Sunscreen is preferred as a cream medication due to its ease of application, comfort, non-stickiness, and easy washability, particularly with oil-in-water creams. Screening agents can reduce symptoms of skin cancer and photo-damage caused by UV exposure. Pharmaceutical companies can satisfy consumer demand by creating superior and high-quality sunscreens that are safe, effective, and aesthetically pleasing. There are three components of the UV spectrum:

UVA

It has the longest spectrum, i.e. 320-400 nm range, enters the skin more deeply, causing long-term harm to the skin cells resulting in tanning and sunburn.

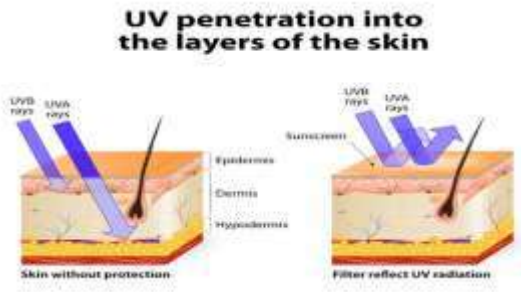
UVB

It has the medium spectrum, i.e. 290-320 nm range, affects the uppermost skin cells causing DNA damage, premature tanning and skin cancer.

UVC

It has the shortest spectrum, i.e. 100-290 nm range, damages the uppermost layer of the skin causing inflammation, sunburn, DNA damage and skin cancer.

Sunscreen products come in various forms, including creams, lotions, sticks, gels, sprays, ointments and powders. Sunscreens are utilised topically for preventing UV rays from entering the skin by absorption or reflection. Sunscreen product development includes regulatory considerations. Creams are available in two emulsion types: W/O or O/W, depending on manufacturer choice.



UV Penetration in skin

CLASSIFICATION OF SUNSCREEN

A. Organic Sunscreen
B. Inorganic Sunscreen

A. Organic Sunscreen: The active ingredients of organic UV filters can absorb UV light in a specific wavelength range based on their chemical composition. Following energy absorption, the UV filter alternates between a low energy ground state and a high energy excited state.

B. Inorganic Sunscreen: UV light is absorbed, scattered, or reflected by inorganic materials. Utilising ultrafine or micronized particles might lessen their inherent disadvantages of becoming opaque and producing a "whitening effect."

IDEAL CHARACTERISTICS OF SUNSCREEN

- Absorbs the light preferentially between 280nm and 320 nm.
- Remain steady in the presence of heat, light, and sweat.
- Don't be harmful, irritating, or sensitising.

- Not be quickly absorbed. Maintain a neutral pH.
- Absorb a wide spectrum of UV radiation to prevent sunburn.
- It must remain stable when exposed to sunshine.
- It must be able to completely protect skin.
- It must be difficult to remove with water.
- At low concentrations, it should be chemically inert, safe, and efficacious.
- Must not result in toxicity, irritation, or sensitisation.
- Able to maintain the sun screening effect for a number of hours.
- Water resistance.
- Preferably odourless, yet the user may tolerate a slight odour.

ADVANTAGES OF SUNSCREEN

- Easily Accessible.
- Avoid triggering allergies.
- Effective in little amounts.
- No adverse effects.
- Ingredients are readily accessible.
- Non-irritating and non-toxic.
- Have a neutral pH.
- Have heat stability.
- Simple to produce.

DISADVANTAGES OF SUNSCREEN

- The product is expensive.
- Forms an obstructive covering, causing sweat.
- It may be less effective if not implemented accurately and freely.
- White drip may form on the skin while you sweat.
- Sunscreen may cause adhesiveness in specific skin areas.

BENEFITS OF SUNSCREEN

- Blocks UVB rays to prevent sunburn.
- Reduces the chance of developing skin cancer by shielding skin cells from UV ray damage.
- Prevents wrinkles and sagging caused by premature skin ageing.
- Reduces the visibility of blotchy skin.
- Lowers the chance of developing melasma and hyperpigmentation.
- Prevents the flare-up of several skin disorders.

SUN PROTECTION FACTOR (SPF)

The sun protection factor (SPF) of a sunscreen indicates its capability to prevent sunburn. When applied properly, a sunscreen with a higher SPF is more effective than one with a lower SPF at preventing sunburn and UVA radiation damage. Because it protects against UVA as well as UVB rays, broad-spectrum coverage increases its effectiveness. According to the FDA, skin cancer can be prevented by wearing sunscreen with an SPF of 15 or more, as well as by taking extra precautions such wearing sunglasses and avoiding the midday sun. Prevention levels are stated as follows in various places:

- Low level prevention: SPF is less than 15.
- Medium level prevention: SPF is between 15 to 29.
- High level prevention: SPF is between 30 to 49.
- Very high-level prevention: SPF exceeds 50.

MECHANISM OF PHOTOPROTECTION

Sunscreen reduces the harmful effects of ultraviolet rays and has been shown to improve skin resistance to UV exposure. They work with two mechanisms. Inorganic sunscreens function by scattering and reflecting UV energy from the skin's surface, creating a layer that prevents sun rays from penetrating. Absorption of UV light by

transforming it into heat energy, hence decreasing its adverse effect

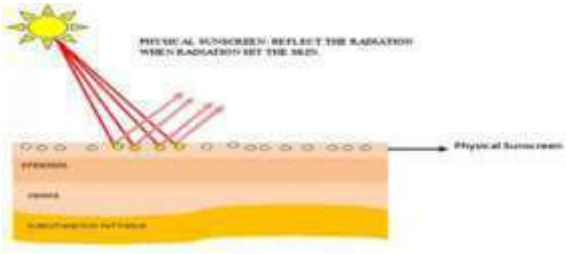


Fig. 1:- Mechanism of Photoprotection

MATERIALS AND METHODS

Plant Materials

Cocoa butter

Cocoa butter contains fatty acids and phytochemicals, which helps to fully moisturise the skin and strengthen its natural barrier. Sunscreen compositions should include this ingredient to prevent skin dryness from sun exposure. A reliable skin barrier might decrease the absorption of UV radiation and environmental contaminants. Cocoa butter includes antioxidants such as polyphenols and vitamin E, which protects the skin from premature ageing and free radical damage caused by UV radiation. Cocoa butter is an emulsifier and thickening substance that enhances the feel and texture of the product and the simplicity of application.

Fig. 2:- Cocoa butter

Coconut oil

Coconut oil in sunscreen primarily functions as a moisturiser and texture enhancer. Coconut oil is a great emollient. It moisturises the skin and prevents dryness from sun exposure. Maintain your skin's natural moisture barrier. Coconut oil aids in the dissolution and distribution of oil-soluble UV filters or minerals such as zinc oxide, therefore increasing the uniformity and application of sunscreen. Coconut oil contains a natural SPF of 4-7, which offers minimal protection. It contains antioxidants such as vitamin E, lauric acid and myristic acid, which have anti-inflammatory and antibacterial properties. Coconut oil gives a smooth, spreadable texture to sunscreen formulas, improving the physical sensation and allowing the lotion to glide evenly across the skin.

Fig. 3:- Coconut oil

Aloe vera gel

Aloe vera has been known for soothing sunburnt or irritated skin. It aids in lowering the redness and inflammation brought on by sun exposure in sunscreens. Aloe vera includes mucopolysaccharides that aid in skin hydration retention. This lessens the likelihood of dryness brought on by extended exposure to sunlight or the drying impact of certain chemical sunscreens. Antioxidant-rich vitamins A, C and E are present in it which counteract the free radicals produced by UV rays, they offer an extra degree of defence. Aloe vera helps heal moderate sun damage by promoting skin regeneration and healing. It might

support the preservation of the skin's protective layer even after exposure to UV light. Aloe vera's gel-like structure increases sunscreen's spread ability, which facilitates even application.

Fig. 4:- Aloe vera gel

Rose oil

Rose oil is a form of essential oil that is being utilised more and more in skincare products, such as sunscreens, because of its potential health and protective qualities. The phenolic chemicals citronellol, geraniol, and eugenol are abundant in rose oil, which also has potent antioxidant qualities. By assisting in the neutralisation of free radicals produced by UV exposure, antioxidants may help prevent photoaging and lessen oxidative stress. Its anti-inflammatory properties might strengthen the skin's defences against inflammation and lessen reactions brought on by the sun. It offers a pleasing scent that improves the consumer's experience without the need for artificial fragrances. Its soothing scent can help create a luxurious skincare experience. Natural emollients included in rose oil aid in preserving moisture in the skin, which is essential when your skin is subjected to the drying consequences of heat and sunlight.

Fig. 5:- Rose oil

Chemicals

Chemicals	Roles
Stearic acid	Emollient
Glycerin	Moisturizer
Methyl paraben	Preservative
Vitamin E	UV-B protectant
Cetyl alcohol	Thickener
Zinc oxide	Photoprotection
Avobenzone	Fragrance

AIM AND OBJECTIVES-

Aim- Preparation and evaluation of sunscreen cream.

- **Objectives-**

1. For developing sunscreen formulations with herbal ingredients.
2. To carry out physicochemical characterization.
3. To attain the highest durability of the formulation.
4. To attain the highest level of UV protection.
5. To create a variety of formulations.
6. To prevent UV radiation from penetrating the skin.
7. To lower the risk of skin cancer.

PREPARATION OF SUNSCREEN CREAM

Ingredients

Table 1: Ingredients and their quantities

Ingredients	Quantity

Cocoa butter	10g
Aloe vera gel	8g
Coconut oil	6ml
Rose oil	6ml
Stearic acid	2ml
Glycerin	5ml
Methyl paraben	1g
Vitamin E	2 capsules
Cetyl alcohol	2ml
Zinc oxide	1g
Avobenzone	1ml
TOTAL	40g

Preparation method

1. In a china dish, melt the cocoa butter. Then, add the calculated amounts of coconut oil, rose oil, olive oil, and raspberry seed oil. Finally, heat the mixture to 60° C.
2. After that, heat the liquid above and add the aloe vera gel.
3. Using a mortar and pestle, separately grind zinc oxide to a fine powder.
4. Stearic acid, glycerine, cetyl alcohol, zinc oxide, and avobenzone should all be precisely weighed and added to the combination above.
5. It should then be heated to 60°C.
6. Fill the mixture in the appropriate airtight container and then properly label it.

EVALUATON OF SUNSCREEN CREAM

Physical evaluations

Physical parameters

- Colour: A manual inspection and observation of the formulation's colour were conducted.
- Odour: The formulation's odour was assessed by using the available formulation and smelling it.
- Appearance: The formulation's appearance was examined.

Fig. 6:- Physical parameters

Determination of pH

Approximately 1 g of cream was carefully weighed and distributed in 100 ml of filtered water. The dispersion's pH was determined with a digital pH meter. The conclusions were verified three times, and the standard deviations was noted.

Fig. 7:- Determination of pH

Spread ability

Excess sample had been placed between two glass slides. In order to compress the formulation to a homogeneous thickness, 50 g of weight was placed on a slide for 3-5 minutes. The time it took to split the two slide was used to assess spread ability. The results have been recorded.
The formula for calculation of spread ability is:-
$S = M \times L$ /t

Wash ability

A small amount of cream was applied to the part of the hand and then washed under the running water to determine the result.

Homogeneity

Touch and visual inspection were utilised to ensure that the formulation was homogeneous.

Irritancy test

Apply a little amount of the prepared sunscreen cream on the dorsal side of the hand and wait 5-6 minutes to see if any irritation appears.

Fig. 8:- Irritancy test

Determination of viscosity

The viscosity of cream was measured using a Brookfield viscometer. A suitable spindle was chosen for the formulation, and working conditions were established. The viscosity was tested at a rate of 6 rpm with constant torque.

Rancidity

This test was conducted with phloroglucinol solution. Fats and oils oxidise and become rancid. Mix 20 ml of cream with 20 ml of strong HCl acid and 20 ml of phloroglucinol solution. Stir for two minutes. The reaction between free fatty acids and phloroglucinol solution results in a pink colour. A pink colour suggests rancidity in the product.

Thermal stability

In this the oil-cream separation was investigated in a humidity chamber set at 37±1°C and 50–60% relative humidity. For 6 hours, the container was placed at 37±1 °C and 50–60% relative humidity in a humidity compartment. For the cream to evaluate the test, there should not be any oil separation.

Table 2: Physical Evaluations

Appearances	Smooth
Colour	Pale yellow
State	Semi solid
Consistency	Good
Texture	Smooth
Irritation	Non
Spread ability	Good
pH	7.46
Rancidity	No pink colour
Wash ability	Washable
Homogeneity	Homogeneous
Thermal stability	No oil separation

Chemical Evaluations

Emulsification test

Determines the emulsion's stability during preparation (water-in-oil or oil-in-water).

Preservative efficacy test

Determines preservatives' ability to suppress microbial development.

Detection of moisture content

Transfer 5 g of the mixture onto a petri plate. Dry at either 100°C or 110°C until two successive observations differ in weight. The maximum variation between the dehydrators is 0.5 g. Weight loss is typically reported as moisture.

Antimicrobial activity

The diameter of the discs and the presence of an area of restriction both demonstrate antimicrobial activity. The antibacterial activity results using

Candida albicans are displayed. This aids in selecting a composition that works well.

RESULT

A wide range of absorption is essential for a sunscreen lotion to help prevent sunburn and other skin damage. During product handling and storage, the formulation's acceptability is influenced by its spread ability, homogeneity, heat stability, and pH. No discomfort, swelling, or itchiness was seen in the lotion's preparation. A formulation's colours did not noticeably alter after being stored for an extended period of time. The pH of the formulation ranges from 7 to 9. The quality and texture of the herbal sunscreen cream are nice. When applied to the skin, the cream spreads nicely, according to an assessment of the formulation's spread ability. It may have antioxidant properties.

SUNSCREEN CREAM 40g

***Composition :**

Cocoa Butter	**:10 g**	**Lic No.**	**: CFD05**
Aloe Vera Gel	**:8 g**	**Batch No.**	**: B**
Coconut oil	**:6ml**	**Mfg Date**	**: May 2025**
Rose Oil	**:6ml**	**Exp Date**	**: May 2026**
Stearic Acid	**:2g**	**MRP**	**: Rs. 160**
Glycerin	**:5ml**		
Methyl Paraben	**:1g**		
Vitamin E	**:2 capsules**		
Cetyl Alcohol	**:2ml**		
Zinc Oxide	**:1g**		
Avobebenzone	**:1ml**		

***Category : Anti-inflammatory**

***Storage : Store at room temperature**

FOR EXTERNAL USE ONLY

***MFG BY : FABTECH COLLEGE OF PHARMACY, SANGOLA**

DISCUSSION

Preventing sunburn from UV Rays exposure is the most obvious immediate advantage of sunscreens now on the market. It has been proposed that this effect is both advantageous and potentially problematic. Preventing sunburn has the obvious advantage of perhaps lowering the incidence of non-cancerous and possibly skin cancers due to the harshness and occurs of UV radiations. Research looked at the effectiveness of herbal sunscreen lotion in avoiding sunburn and tried to create one utilizing rosemary extract. It can function on the finished product as well as throughout the production process. In addition to their antioxidant action, natural chemicals or bioactive products have drawn a lot of attention recently as a UV protection agent because of their presumed safe uses, environmental concerns, and low side effects. Plant extracts, which contain a diverse variety terpenoids, polyphenols, phenolic constituents, alkaloids typically cover the entire UV wavelength spectrum. Coconut oil contains phytosterols, fibres, glycosides, phenolics, flavonoids, tannins, and saponins, and other compounds. Aloe vera contains several phytochemicals, including flavonoids, phenolics, triterpenoids, and carotenoids. The results demonstrated high to medium UV absorption across the entire spectrum.

CONCLUSION

UV radiation from sunlight can cause skin damage, including sun burn, skin cancer, early ageing, and other issues. UV radiation has three subtypes: UVA, UVB, & UVC. UVA, with its longest wavelength, penetrates the innermost layers of the skin and can cause ageing and tanning. UVB, with its shorter wavelength and ability to break DNA, can cause skin cancer and sunburn. The Earth's ozone layer prevents UVC from penetrating the surface. Using herbal sunscreen cream with coconut and rose oil is an efficient and secure way to prevent the skin from harmful ultraviolet rays. Rose oil has antioxidant and anti-inflammatory properties that can soothe and prevent the skin. Coconut oil contains Vitamin E, which has antioxidant and anti-aging properties. Herbal sunscreen lotion may also include other natural ingredients, such as aloe vera, that can help to moisturise and nourish the skin, alongside to these ingredients. Herbal sunscreen cream is a good choice for those with sensitive skin because it typically contains no harsh chemicals or fragrances. All things considered, using a herbal sunscreen lotion that contains coconut and rose oil is a safe and efficient way to protect your skin from the sun's damaging ultraviolet rays. For those who prefer using natural products and have sensitive skin, it's a good option.

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