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Herbal Sunscreen Cream SPF Determination by In Vitro Model

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Abstract: *Sunscreen is a substance that helps shield the skin from UV radiation. While UVA radiation may cause more skin damage, UVB radiation produces sunburn. The perfect sunscreen should block both wavelengths. The purpose of this study was to create a topical herbal sunscreen formulation by mixing medicinal herbs with specific fixed oils. Regular application of sunscreen lowers the risk of actinic keratosis, squamous cell carcinoma, and melanoma. Both organic and inorganic compounds can be found in sunscreen. Another name for sunscreen is sunscreen lotion. Products that reflect or absorb UV rays from the sun to protect the skin from melanoma, squamous cell carcinoma, and actinic keratosis.Both organic and inorganic compounds can be found in sunscreen. Sunblock lotion is another name for sunscreen. The product shields the skin by reflecting or absorbing UV rays from the sun.*

Keywords: skin burn, SPF (sun protection factor), herbal sunscreen, and Asian pigeonwings

I. INTRODUCTION

A substance that helps protect the skin from the sun's harmful rays. Sunscreens work by reflecting, absorbing, and dispersing UVA and UVB rays to provide protection. Skin cancer can be prevented by protecting the skin from injury and premature aging by using lotions, creams, or gels that include sunscreen. Sunblock formulas must be created to improve the degree of sun protection factor (SPF), heal and lessen sunburn, sun tanning, skin melanoma, and early fine lines and wrinkles. Sunscreens are frequently used to protect the skin from UV rays and reduce the risk of developing sun-related skin problems.Broad-spectrum sunscreens are the subject of ongoing research to mitigate the long-term effects of excessive UV exposure.[2] The use of sunscreens as photoprotectants has significantly changed during the last few decades. As more individuals realize that sunscreens can help prevent melanomas, sunburns, and aging skin. The need for sunscreen formulations will inevitably rise, and pharmaceutical companies have a significant chance to meet this demand by creating high-quality, safe, effective, and visually appealing sunscreen formulations.[3] Sunscreen lotion is a chemical that traps ultraviolet light, or UV rays, to shield the sun's harmful rays. UV radiation is divided into

UVA: the longest wavelength, between 320 and 400 nm, causes immediate sunburn and tanning by harming the dermis and inner skin cells.

UVB: Blisters, sunburns, and delayed tanning are caused by this medium-wavelength light, which has a wavelength between 290 and 320 nm.

UVC: Redness, ulceration, and lesions are caused by UVC, the shortest wavelength, which ranges from 100 to 290 nm.

UV rays are absorbed by certain bioactive substances in the environment, protecting the skin from their harmful effects. Due to their safety, lack of unpleasant responses, lack of dangerous chemical components, and environmental integrity, biologically active compounds have recently become more and more popular in cosmetic formulations. Because synthetic photoprotective chemicals are more likely to be dangerous and carcinogenic. Due to sunscreen's ability to act as a photoprotective agent, UV protection is understandably quite popular [1] Sunscreen preparation is used topically with the aim of increasing the Sun Protection Factor (SPF) and healing, preventing, or resisting the unpleasant or harmful consequences of sunburn, suntan, skin cancer, and premature skin aging[1,2,3].Sunscreens are a natural defense mechanism that protects the skin, the body's outermost layer, from harmful UV rays.

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Photo protection Mechanism:

The antioxidants that help protect the skin in the outer layer, middle layer, and deeper layer are used up because of damage from UV radiation that gets into the skin. An immediate and permanent pigment darkening will result from photooxidation of pre-existing melanin and its precursors.

It has been demonstrated that by preventing and lessening the negative effects of UV radiation, sunscreen improves the skin's resistance to UV radiation. They operate in two ways. Sunlight rays cannot penetrate the skin thanks to mineral-based sunscreens made of inorganic minerals, which scatter and reflect UV rays from the skin's surface.

[9]

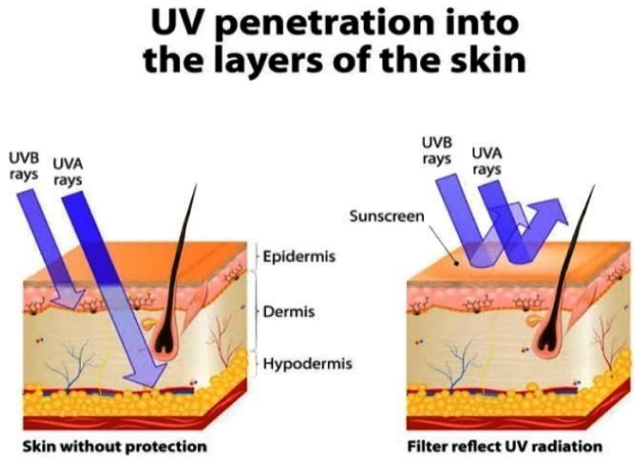

Figure:1

II. MATERIAL AND METHODS

Shea butter

It is extracted from the shea nut's fat. The African savannas are the birthplace of the shea tree. It has the ability to quickly soak into the skin at body temperature, melt at body temperature, and produce benefits without leaving the skin feeling greasy. It has antioxidant properties and contains vitamins A and E, which promote blood circulation beneath the skin's surface and improve skin cell renewal. The oil offers essential defense against hazardous UV radiation because it includes cinnamic acid.

Figure:2 Shea butter

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Beeswax, or Cera alba

It is a wax that is produced spontaneously by Apis honeybees. Although it can also be used to maintain emulsions, beeswax foundation is primarily employed as an emulsifier and thickener. Beeswax is used to melt the solids so that the water phase components can be heated and mixed more easily. Its main purpose is to give food a creamy mouthfeel.An effective active ingredient to include in your sunscreen mixture is aloe vera. It has been shown to be successful in both preventing and curing skin burn

Figure:3 Beeswaxl

Aloe vera

Aloe vera is one of the best ingredients to be used in sunscreen but it alone may not provide the necessary protection from the sun's UV rays. It is used in many premium-quality sunscreens because it moisturizes, nourishes, and soothes skin irritation.Water with a rose flavor Vitamin B, which is commonly contained in sunscreen and sun protection products, is present in rose water. It helps to boost the effectiveness of SPF.

Figure:4 Aloe vera

Rose water

Vitamin B, which is commonly contained in sunscreen and sun protection products, is present in rose water. It helps to boost the effectiveness of SPF. One effective remedy for skin discoloration is rose water. By unclogging your pores, rose water enables you to cleanse your skin of impurities and oils. It helps maintain your skin's pH equilibrium.

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Figure:5 Rose water

Carrot seeds oil

With its high levels of vitamin A, essential oil plays a crucial part in delivering antifungal, antibacterial, antioxidant, and aromatic properties. It provides sun protection as well. Carrot seed oil has a natural SPF of 38 to 40, according to a 2009 study published in "Pharmacognosy Magazine" [7]. You can use carrot seed oil on your skin before you go outside in the sun by combining it with a carrier oil

Figure:6 carrot seed oil

Sandalwood Oil

It is commonly known that sandalwood has a high content of antioxidants. It is a powerful anti-aging ingredient in skincare products. Unstable chemicals called free radicals harm skin cells and hasten the aging process. In the battle against these molecules, antioxidants are essential. Regular application of sandalwood can help reduce fine lines and wrinkles, providing the appearance of a brighter, younger face. It is vital for keeping the suppleness and firmness of the skin since it aids in the regeneration and repair of skin cells..

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Figure: 7 sandalwood oil

Vitamin E capsule

Vitamin E offers further protection against acute UVB damage and against cell mutation caused by exposure to the sun and pollution. By removing impurities from the skin, vitamin E helps to make the skin softer and cleaner. Vitamin E and lemon juice work together to lighten skin. It is most famous for enhancing skin health and beauty. It has antioxidant and anti-inflammatory properties. in.

Figure:8 vitamin E capsule

Coconut oil

Coconut oil keeps the skin smooth and velvety while preventing premature aging. To moisturize and exfoliate dead skin cells, apply coconut oil to your skin. Even people with eczema or other skin disorders can benefit from using coconut oil to moisturize their dry skin. Its antiviral, antifungal, and antibacterial properties prevent free radical damage to the skin and promote wound healing

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Figure :9 coconut oil

Zinc Oxide

Apply zinc oxide sunscreen to the skin's surface, where UV rays reflect, scatter, and absorb. Since UV radiation is the main cause of skin cancer, zinc oxide sunscreen can help prevent the disease.

Figure:10 Zink oxide

III. METHOD Of PREPARATION

Melt coconut oil, shea butter, and beeswax in a double boiler.
Stir until smooth and well combined.
Remove from heat and add sandalwood oil and coconut oil
Stir in zinc oxide powder, vitamin E oil, and aloe vera gel , Rose water.
Pour into a glass jar or tin.
Allow to cool and solidify before use

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Formulation tablet:

Sr.no	Ingredients	Formulation 1	Formulation 2	Formulation 3
1	Zink oxide	2.5gm	2gm	3gm
2	Carrot seed oil	3ml	3ml	2ml
3	Sandwood oil	3ml	3ml	3ml
4	Bees wax	1.5gm	2gm	2.5gm
5	Shea butter	2gm	2gm	1.5gm
6	Coconut oil	2ml	3ml	2ml
7	Vitamin E capsule	2ml	1ml	2ml
8	Aloe vera	2gm	2gm	3gm
9	Rose water	2ml	2ml	1ml

Formulations

Formulation 1

Formulation 2

Formulation 3

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Evaluation test:

1] DETERMINATION SUN PROTECTION FACTORS

Calculating the sun protection factors (SPF) may be used to determine how effective a sunscreen product is. It is Sometimes referred to as difference between UV energy required to create minimum erythema dose (MED) on Sunscreen applied human skin and the UV energy required to produce a unprotected skin.

SPF = MINIMAL ERYTHEMA DOSE FOR PPROTECTED SKIN BY
MINIMAL ERYTHEMA DOSE FOR UNPROTECTED SKIN

Formula : SPF = CF × EE × I (λ) × abs (λ)

Where: The SPF value can be calculated by multiplying the correction factor (CF), the erythema effect spectrum (EE), The intensity spectrum from the sun (I), and also the absorbance (Abs) of the gel sample.

[2]Spreadability test :

A key elements of a sunscreen is the spread ability indicator. It look at how quickly it spread and how much residue There after touching it. There is extra technique for the spread ability test that requires as to take sample of slide, apply Sunscreen, place another slide to slide off. The time required to separate the slides it's how it defined.

Spreadability = WXL /TW Where

W=weight attached to the upper slide

L=stand for slide length

T = times taken in seconds

[3]PH TEST – for improved product stability and expression of sunscreen, the proper ph should be checked. After this For better accuracy this formulation was kept under observation in digital PH meter

[4] Irritancy test-

Topical ingredients applied on

The skin can cause oedema and erythema as antagonist and hypersensitive. A standard 24-hour irritancy test should be Run an reported.

[5]DETERMINATION OF VISCOSITY -the Brookfield viscometer is use to the test viscosity with the proper number

Of spindle selected. A 50ml beaker was used to until the spindle grove was dipped and the rpm was set herbal sunscreen

Viscosity was measured the sunscreen. The viscosity was completed using the factor obtained from the reading.

[6] HOMOGENEITY — By touching and looking at the sunscreen , we can quickly determined its homogeneity, Consistency and roughness.

STABILITY — The assessment procedure for sunscreen place a significant emphasis on the thermal stability. It is Necessary to assess the sunscreen expression. Stability at increased temperature.

IN VITRO—OCCLUSION STUDIES — skin occlusion in indicated by complete coverage of the skin surface the Follow equation can be used to determination. The oculasive of herbal sunscreen.

Occlusive factor — (f) =(A-B) /A×100

Where, A= water loss without sample by water loss with sample.

REMOVAL TEST – Sunscreen is applied to skin and in addition to other part therefore it should be simple to Remove after use . The wearing sunscreen is use. The wearing sunscreen is increased by easy removed after use. Hence A removal test should be conducted and exported.

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Observation:

Organoleptic test:

Formula	Formulation 1	Formulation 2	Formulation 3
Colour	White	White	White
Odour	Characteristics	Characteristics	Characteristics
Homogeneity	Homogenous in nature	Homogenous in nature	Homogenous in nature

Evaluation test:

Formula	Formulation 1	Formulation 2	Formulation 3
Spf value	14	18	20
Spreadability test	20	22	22
Feel test	Cool sensation	Cool sensation	Cool sensation
Removal test	Easily removal	Easily removal	Easily removal
Ph test	6	6	6
Viscosity	150	155	160
Occultation test	60	60	66
Stability test	stable	Stable	Stable
Irritancy test	No irritate	No irritate	No irritate

III. RESULT

Results of our study revealed that 100% of selected herbal sunscreens are photostable in the UVB range, and 71% of them are stable In both UVA and UVB range. Subjective study by in vivo SPF determination revealed that 98% of the sunscreens effectively provide protection to the skin from sunburns. Overall data obtained after quality evaluation study substantiate that all products are safe and efficacious.

IV. CONCLUSION

Using sunscreen has been standard procedure throughout the years to shield human skin from the sun's damaging UV radiation. Due to the recognized negative effects of synthetic sunscreen, natural sunscreen agents are more in demand these days than synthetic ones. Compared to synthetic sunscreens, they are far safer, far more affordable, and have skin-beneficial effects, which is why they are garnering a lot of attention. These phytoconstituents provide them additional qualities that make them ideal for sunscreen compositions. Their UV absorption range is vast, and they offer protection against cancer, inflammation, and a host of other issues.

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