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Formulation and Evaluation on Sunscreen Lotion

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Abstract: *Sunscreen is a chemical compound that helps protect you from UV rays sunburn is caused by ultraviolet B radiation but ultraviolet a may be more damaging to the skin. Sunscreen should ideally block both wavebands. The aim of this study was to develop a topical sunscreen formulation based on some fixed oils,in combination with some medical plants. Regular use of sunscreen reduces the development of actinic keratosis, squamous cell carcinoma and melanoma. Sunscreen may be organic or inorganic chemicals. Sunscreen is also known as sunblock lotion. The product absorbs or reflects the sun's ultraviolet radiation and protects the skin. The increasing incidence of skin cancers and photo-damaging effects caused by ultraviolet radiation has increased the use of screening agents, which have shown beneficial effects in reducing the symptoms. Sunscreen agents should be safe chemically inert,non-irritating non-toxic, photo-stable an able to provide complete protection to the skin against damage from solar radiation.*

Keywords: herbal sunscreen, SPF, Sunburn

I. INTRODUCTION

A substance that helps protect the skin from the sun's harmful rays. Sunscreens reflect, absorb, and scatter both ultraviolet A and B radiation to provide protection against both types of radiation. Using lotions, creams, or gels that contain sunscreens can help protect the skin from premature aging and damage that may lead to skin cancer. Sun-block formulae must be created for repair, reduction of sunburn, sun tanning, skin melanoma, and early fine lines and wrinkles, as well as increasing the degree of sun protection factor (SPF) . Sunscreens are frequently applied to the skin to protect it from the sun's harmful rays and to reduce the risk of skin disorders caused by the sun'srays. Broadspectrumsunscreens are now being researched to reduce the long-term effects of high UV Radiation.

The use of sunscreens as photo protectants has evolved significantly over the last few decades. With increasing awareness of the protection afforded by sunscreens against sunburns, skin aging and melanomas, the demand for sunscreen formulations will invariably increase, and there exists significant aopportunity for pharmaceutical industries to fulfill this demand by manufacturing quality, efficacious, safe and aesthetically appealing sunscreen formulations. Sunscreen lotion is a sort of product that protects against the sun's harmful rays by containing ultraviolet radiation (UV rays), which is divided into UVA, UV B, UV C rays.

• UVA: longest wavelength with 320-400nm, it affects inner cells in the top of skin including dermis and causes immediate tanning and sunburn.

• UVB: Medium wavelength with 290-320nm, it affects the cells in the top layer of skin and causes delayed tanning, sunburn and blisters.

• UVC: Shortest wavelength with 100-290nm, it affects the outermost cells in the top layer of skin and causes redness, ulcers and lesions.

UV rays are absorbed by certain bioactive substances in the environment, which protects the skin from their harmful effects. Because of their safety, absence of unpleasant responses, lack of dangerous chemical components, and environmental integrity, biologically active compounds have become more popular in cosmetics formulations in recent years. Because synthetic photo-protective chemicals are more likely to be dangerous and carcinogenic, phytoconstituents are gaining favor as major cosmetics ingredients due to their natural anti-cancerous, anti-mutagenic, and non-toxic properties.

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Genuine herbal elements in sunscreen are the least irritating to the skin, especially for sensitive skin, include natural components, can regenerate the skin, and give enough protection against pollution and climate changes in the atmosphere.

1 CLASSIFICATION OF SUNSCREEN

Sunscreens can be classified as follows

1. Based on the mode of action they can be classified as

a. Physical sunscreen: Reflect harmful rays away from skin.

Eg: zinc oxide and titanium dioxide.

b. Chemical sunscreen: Absorbs UV raysEg: micro fine titanium dioxide, avobenzone and oxybenzone

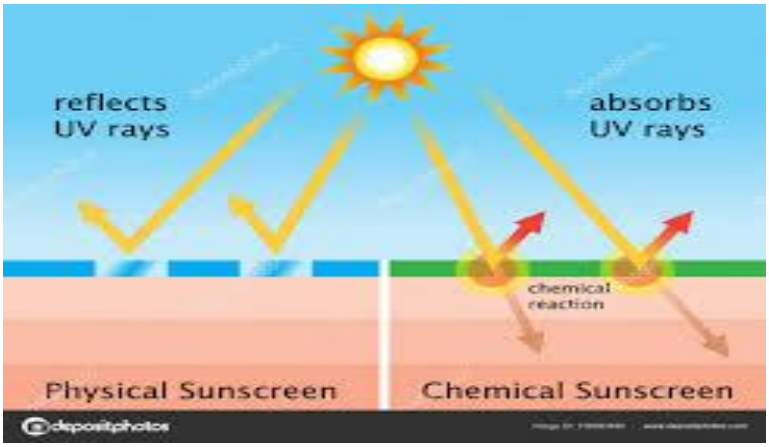

Fig. Classification of sunscreen

The combination of both physical and chemical active ingredients is considered to be a best sunblock. Physical sunblocks are having scattering affect thereby results in whitening phenomenon while majority of organic chemicals used in sunscreen formulation have not been established as safe.

• Based on application

a. Topical: They either absorb or reflect radiation to protect from harmful radiation

b. Oral: These are consumed orally to avoid skin damage. Eg: Carotenoids

• Topical sunscreens are divided into two classes based on their mechanism of protection

Organic sunscreen

Inorganic sunscreen

Organic Sunscreen: Organic sunscreen works by absorbing into skin and converting UV rays into heat .it is thin and ideal for everyday use allow for skincare ingredients to be added easily. Organic sunscreen actives chemical carbon based compound .it contains non mineral active ingredient.

• Inorganic sunscreen: These are particles that scatter and reflect uv rays back to the environment they act as physical barrier to indent ultraviolet and uv light. They are considered broad spectrum as they cover entire ultraviolet spectrum .the Inorganic sunscreen is also referred to as sunblock.

IDEAL PROPERTIES OF SUNSCREEN LOTION

1. Must absorb a broad range of UV rays causing sunburn
2. Must be stable in the presence of sunlight
3. Should be able to provide complete protection for skin
4. Should be safe effective, chemically inert, at low concentration
5. Should not cause irritation, sensitization and toxicity

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6. Should not stain Filtering
7. Activity against UVB and UVA radiation
8. Anti-oxidant and reactive oxygen species scavenging property
9. Anti-mutagenic property
10. Anti-cancer property

MERITS OF SUNSCREEN LOTION

1. Helps to prevent sunburn and premature aging
2. Protects from the sun as soon as it is applied.
3. Lasts longer when in direct UV light.
4. Better for those with heat-activated skin[redness].
5. Offers protection against UVA and UV B rays.

DEMERITS OF SUNSCREEN LOTION

1. It is an expensive product.
2. Can create an occlusive film which results in perspiration.
3. Can be less protective if not applied accurately and generously..
4. Can cause white drips to show on the skin when sweating

.5. Sunscreen can cause stickiness in some skin types

Importance of sunscreen :

The most efficient way to protect skin from harmful UV radiation is the topical application of any active molecule which has UV absorbing or reflecting properties. This is why the sunscreen has gained importance in the current scenario.Wearing sunscreen is one of the best and easiest ways to protect your skin's appearance and health at any age. Used regularly, sunscreen helps prevent sunburn, skin cancer and premature aging. To help make sunscreen a part of your daily routine.

MECHANISM OF PHOTOPROTECTION

UV rays mediated photo oxidative damage reaches the dermal capillaries via epidermis and dermis And cause depletion of enzymatic and non-enzymatic antioxidants in Stratum corneum epidermis and Dermis. Photo oxidation of pre-existing melanin and its precursors will occur which result in immediate and Persistent pigment darkening.Sunscreen act by preventing and minimizing the damaging effects of the Ultraviolet sun rays following exposure to the sunscreen have been demonstrated to increase the tolerance of The skin to uv exposure.

They work on two mechanisms:

Scattering and reflection of uv energy from the skin surface mineral based on inorganic sunscreen works on this mechanism they provide a coating that blocks sun rays from penetrating through the skin.

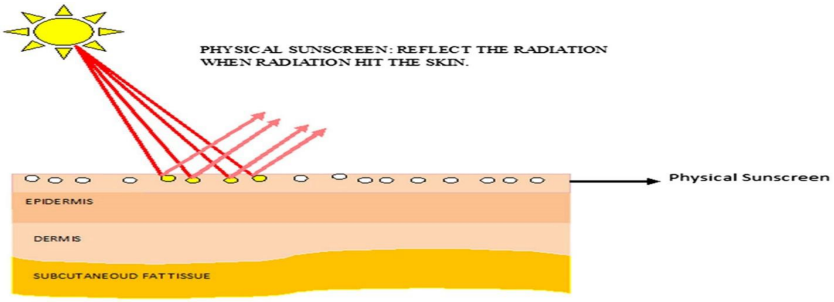

Fig.Mechnasin of photo protection

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LITERATURE REVIEW

Velasco et al. (2008) studied and investigated the development of sunscreens possessing broad spectrum anti-UV radiation effectiveness with reduced concentration of chemical UV filters; and bioactive products have been the focus of several researches due to ecological issues (sustainability), minimum ambient impact and for safe utilization.

• Ashawat et al. (2006) examines the most commonly used herbs in herbal sunscreen lotions are Aloe vera, basil, green tea, almond, olive, jojoba and cucumber.

• Tabriz et al. (2003) Oriented to sunscreen development, the use of natural raw materials that infers UV absorption and skin protection against UVB and UVA tradiation is of great interest,associated with the benefits of the products and compliance of the consumers. Citation: Abhishek D. Purohiet al. Ijppr.Human, 2023; Vol. 27 (4): 597-623. 604• F'guyer et al. (2003) Several botanical compounds have been shown to be antimutagenic, anti carcinogenic and nontoxic and have the ability to exert striking inhibitory effects on a plethora of cellular events at various stages of carcinogenesis. Few examples include tea polyphenols, curcumin, silymarin, garlic compounds, apigenin, resveratrol, ginkgo biloba, beta-carotenoids, and ascorbic acid.antithrombotic, antioxidant, free radical scavenging, anti tumor, antibacterial and anti-protozoa due to their different in vivo action mechanism.

Robins (2003) Important categories of beneficial phytoconstituents include penolicacids, flavonoids, And high molecular weight polypenols.

• Movileanu et al. (2000): Baby et al. (2006).Polypenolic compounds exhibit a wide number of pharmacological properties such as anti-allergic, anti inflammatory,hepatoprotective, vasoactive, antithrombotic, antioxidant, free radical scavenging, antitumor, antibacterial and antiprotozoal due to their different in vivo action mechanism.

• Velasco et al. (2008) Due to the structural similarities between polyphenol compounds such as flavonoids and organic UV filters, they might exert photo protection activity in addition to the antioxidant and absorbance spectrum profiles of these bioactive compounds.

Plan of work

1. Literature Review
2. Material and Instruments
3. Experimental method

• Sample collection

4.Evaluation tests

• Physical parameter
• Determination of pH
• Determination of Viscosity
• Spreadability
• Washability
• Homogeneity
• Stability Testing
• Determination of antioxidant activity
• Determination of SPF

• Aim and objective

Aim :formulation and evaluation of sunscreen lotion containing herbal agents.

Objective:

• To develop sunscreen formulation using herbal ingredients
• To achieve maximum stability of formulation
• To achieve maximum uv protecting effect
• To inhibit transmission of UV radiation into the skin
• To reduce the risk of squamous cell and melanoma skin cancer
• To deminish the degree of the pigmentation

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4 .Plant profile
Alovera
Coconut oil
Green tea
Cucumber
Vitamin E
Rose Water
Main role of ingredients used in formulation

Alovera
Alovera is a good active ingredient to reach in Sunscreen arsenal.it has been proven to both Treat and prevent burns on your skin .the leaves of aloe vera and A. Barbadensisare the source aloe vera gel .aloe vera gel is used in cosmetics lotion for its moisturizing and revitalization .it blocks UVA and UVB rays and maintain skin natural moisture balance.It stop the sunburn and Stimulate immune system intervention.aloe vera gel can be used to help with the healing process Of sunburn it help relieve pain and redness by reducing inflammation .the gel also stimulate the production of collagen.it helps in negate harmful effects of free radicals on skin due to exposure to sunlight.

Fig. Alovera gel

Coconut oil
Coconut oil keeps the skin soft and smooth while preventing premature ageing of the skin . coconut oil for skin use as a moisturizer ,remove dead skin cells.coconut oil moisturizing dry skin including in people with condition such as eczema .promoting wound healing it have antibacterial ,anti fungal and antiviral properties which prevents free radicals from causing damage to the skin .coconut oil has anti-inflammatory properties which reduce redness skin this can be helpful for both dry and oily skin conditions by reducing inflammation of the skin.

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Fig. Coconut oil.

Green tea

Green tea is a good ingredient for sunscreen because of it's antioxidant properties and photo protective protective properties.Green tea's polyphenols can help to reduce sunburns and control UV damage to the skin cells.It also may have anti wrinkle effects.It is great source of vitamin E that nourishes skin . Green tea is obtained from the fresh leaves of the plant Camelli sinensis. Polyphenols are thought to be the major chemo preventive mediators. Green tea contains four major polyphenols: (-)-epicatechin (EC), (-)-epicatechin-3-gallate (ECG), (-)-epigallocatechin (EGC), and (-)-epigallocatechin-3-gallate (EGCG). epigallocatechin-3- gallate (EGCG), the major polyphenolic constituent in green tea.

Fig. Green tea

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Vitamin E

Vitamin E it provides extra protection against acute UV damage and protect cell mutation caused by sun and pollution exposure.vitamin E it help cleanse your skin and removing the impurities from and help improve skin elasticity .vitamin E combination with lemon juice it help to whiten the skin.it is most commonly known for it's benefits of skin health and appearance. It has antioxidant and anti-inflammatory properties.

Fig. Vitamin E capsule

Rose water

Rose water contain vitamin B.which often used in Sunscreen and sun product .it helps to bolster the effectiveness of SPF .rose water can be used to lighten the skin pigmentation. Rose water can Remove oils and dirt from your skin by unclogging yours pores. It helps maintain pH level of your skin .It is hydrating and nourishing agent for skin and protect skin against harmful environmental aggressors. Gulabjal has antioxidant levels that tackle free radicals and keep skin healthy and Glowing.

Fig. Rose water

Cucumber

Cucumber Cucumber is popular ingredient in sunscreen and natural skin care products .It contain Antioxidant that protects cell from UV damage caused by ultraviolet radiation.cucumber can help in soothing. It contain vitamin c that helps in the brighten the skin . Helps in tightens the pore.Also help in the moisturising skin.It reduces the puffiness and dark circle Cucumber

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Fig. Cucumber

material and method of formulation

All Ingredients were obtained in their crude form a local distributor (Beed).Green tea and cucumber extract were blended and Triturate mixture continuously

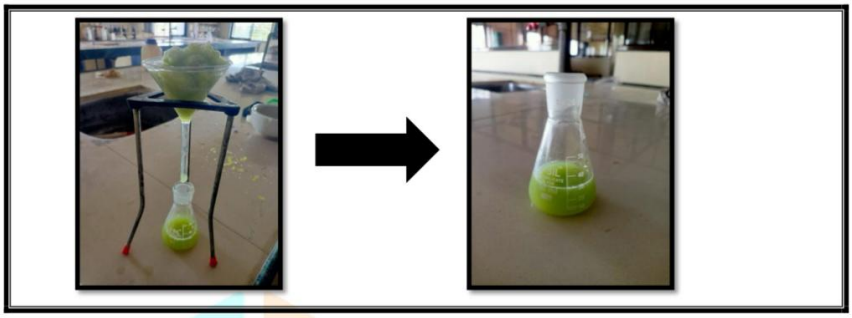

Fig. Isolation of cucumber extract

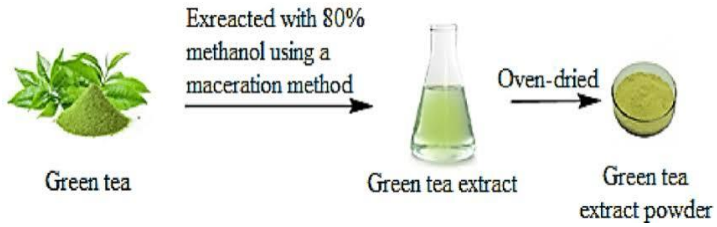

Fig. Isolation of green tea extract

Preparation of Alovera Gel:

- Collect aloe vera leaves.
- Wash & clean the fresh aloe vera leaves.
- Cut the leaves into pieces & take out the pulp from them.
- 4. Now blend the pulp of aloe vera (foam appears) and wait till the foam disappears.
- Take the small quantity of aloe vera gel which can be formed after blending and add xanthin gum, stir the mixture & keep it for 30 min to 1 hr for hydration.
- After this add hydrated mixture into a whole aloe vera gel & leave it 4 to 5 hrs to set (put it in refrigerator)
- Finally aloe vera gel was prepared

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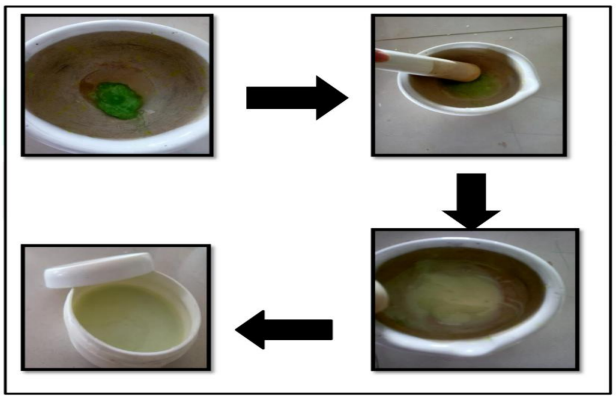
 Formulation of Lotion

Sr. no.	Ingredients	Batches F1	F2
1	Alovera gel	10	12
2	Cucumber extract	7.5	5
3	Green tea extract	5	4
5	Coconut oil	3	3
6	Rose water	q.s	q.s
7	Vitamin E	q.s	q.s

 Preparation of sunscreen Lotion
 The isolated cucumber extract ,green tea extract & aloe vera gel was taken in mortar & pestle.
 Triturate all mixture continuously.
 In another container coconut oil, & vitamin -E was taken & mix them.
 Add this mixture drop-wise to cucumber ,grew tea,aloe vera gel mixture & stirred vigorously
 Now separately add rose water as a quantity sufficient.
 Add-rose water into the cucumber ,aloe vera gel and green tea mixture.
 All the ingredients were mixed vigorously using spatula as no lumps left for about 10 to 20 min. and then placed.
 Leave it for 10 min to set. Hence,sunscreen lotion was prepared.

Herbal sunscreen Lotion



How to use
Step1: Apply required amount onto freshly cleansed face.
Step 2 : spread until fully absorbed.
Step 3 : Repeat after every 2-3 hours depending upon sun exposure.

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Evaluation of sunscreen lotion for sun screening activity

Effectiveness of sunscreen:

The effectiveness of sunscreen is usually expressed by sunscreen protection factor (SPF)which is the ratio of uv energy required to produce a minimal erthemal dose in protected skin to unprotected Skin .A simple ,rapid and reliable in vitro method of calculating the spf is to screen the absorbance of theProduct between 290-320nm at every5nm intervals .SPF can be calculated by applying the following Formula known as Mansur equation.

• SPF spectrophotometric=CF×€EF(wavelength)×I(wavelength)×Abs(wavelength) Where CF=correction factor (10),EE=erythmogenic effect of radiation withWavelength,Abs=spectrophotometric absorbance values at wavelength.

• PHof the cream :

The ph meter was calibrated using standard buffer solution.about 0.5 of the cream was weighed And dissolved in 50 ml of water and it's pH was measured.

• Homogeneity:

The formulations were tested for the homogeneity by visual appearance and by touch.

• Appearance:

The appearance of cream was judged by its colour, pearlscence and roughness and graded.

• Removal:

The ease of removal of the cream applied was examined by washing the applied part with tap Water.

• Irritancy test:

The cream was applied to the specified area and time was noted. Irritancy,erythema ,edema,was Checked if any for regular intervals up to 24hrs and reported.

• After feel:

Emolliency ,slipperiness and amount of residue left after the application fixed amount of cream Was checked.

Type of smear:

After application of lotion, the type or film or smear formed on the skin were checked.

Result

Sr. No	Parameters	Observation
1	Colour	Light green
2	Odour	Characteristics
3	Spreadability	Good and uniform
4	PH	6.5
5	Test of irritably	No irritant

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II. CONCLUSION

The study attempted to develop herbal sunscreen lotion using extract of green tea and cucumber extract and examined their efficacy for preventing their sunburn. It offers day long broad spectrum protection from UV A and UV B Green tea is rich in antioxidants that neutralizes free radicals Cucumber known for it's freshness.It shields skin against IVA and UV B rays and protect against sunburn,sun tanning,and photo damaging that causes the premature apperance of fine lines and wrinkles.

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