

FORMULATION AND EVALUATION OF HERBAL SUNSCREEN CREAM**Saurabh Ambadas Chavhan*¹, Miss. S.B Goykar*²**^{*1,2}Kishori College Of Pharmacy, Babasaheb Ambedkar Technological University, Lonere, India.DOI : <https://www.doi.org/10.56726/IRJMETS59846>**ABSTRACT**

Sunscreen is a chemical compound that help 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 herbal 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 that absorb or reflect the sun's ultraviolet radiation and protect the skin. The increasing incidence of skin cancers and photo damaging effects caused by ultraviolet radiation has increased the use of sunscreening agents, which have shown beneficial effects in reducing the symptoms.

Sunscreening agents should be safe chemically inert , non-irritating nontoxic, photo stable an able to provide complete protection to the skin against damage from solar radiation

Keyword: Herbal Sunscreen, SPF (Sun Protection Factor), Skin Burn, Asian Pigeonwings.

I. INTRODUCTION

Herbal sunsreen also known herbal sunblock .Herbal suntan lotion is a lotion ,spray or other topical product that helps protect the skin from the suns uv radiation and which reduce sunburn and other skin damage Sunscreen can be classified into two types sunscreen

1. Physical sunscreen

Those that reflect the sunlight.

2. Chemical sunscreen

Those that absorb the uv light

Sunscreen agents are for external use only .the use of sunscreen as photo protecting agents for uv protection. The sunscreen formulation is which when applied topically protect the treated area from sunburn sunscreen depends on ability to protect against uv induced sunburn and their chemo preventive activity. Excessive solar ultraviolet radiation are responsible for various skin damages such as sunburn ,skin pigmentation premature aging and photo carcinogenesis .The main mechanism of skin damage by uv radiations is formation of Reactive Oxygen Species(ROS) that interact with proteins lipids and subsequently alter them. UVB and to a lesser extent UVA are responsible for inducing skin damages .

Sunscreen should contain antioxidant agent in addition to sunblock agent to be effective in prevention of photo aging and skin cancer .plants due to their antioxidant potential are known as attractive option to be used in Sunscreen formulation for prevention of skin damage due to solar radiation .sunsreen is topical product that protects the skin against harmful effects of the sun .

II. 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.
- Tabrizi et al. (2003) Oriented to sunscreen development, the use of natural raw materials that infers UV absorption and skin protection against UVB and UVA radiation is of great interest, associated with the benefits of the products and compliance of the consumers.

- F'guyer et al. (2003) Several botanical compounds have been shown to be antimutagenic, anticarcinogenic 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.
- Movileanu et al. (2000) Polyphenolic compounds exhibit a wide number of pharmacological properties such as antiallergic, anti-inflammatory, hepatoprotective, vasoactive, antithrombotic, antioxidant, free radical scavenging, antitumor, antibacterial and antiprotozoa due to their different in vivo action mechanism.
- Robbins (2003) Important categories of beneficial phytoconstituents include phenolic acids, flavonoids, and high molecular weight polyphenols.
- Movileanu et al. (2000): Baby et al. (2006). Polyphenolic 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.

Classification of sunscreen and the mechanism of photo protection

Sunscreen are classified as either topical or systemic based on the route of administration topical sunscreen are divided into two classes 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 incident ultraviolet and UV light .they are considered broad spectrum as they cover entire ultraviolet spectrum .the inorganic sunscreen are also referred to as sunblock .

❖ **Mechanism of photoprotection**

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.

Absorption of the UV energy by converting it to heat energy thus reducing its harmful effects and reduce the depth which can penetrate the skin organic sunscreen works on this mechanism.

III. MAIN ROLE OF INGREDIENTS USED IN FORMULATION

➤ **Aloe vera**



Aloe vera 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. Barbadensis are the source of 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 which help a the healing process.

➤ **Butterfly pea flower:**

• **Packed with antioxidant**

Butterfly pea flower contain many antioxidant such as flavonoids anthocyanin and polyphenols. Your skin need antioxidant to improve general health and elasticity. Antioxidant help to minimize fine line and improve your skin and appearance.

• **Soothes minor skin irritation**

Butterfly pea flower it helped calm itching and general irritation. The butterfly pea flower used for use in rejuvenating the skin.

• **Reduce redness**

Because of butterfly pea flowers ability to soothe irritated skin, it also minimize redness caused by acne, dryness, and general irritation. These nourishing properties are further enhanced when combined with other nutrients that benefit skin health.

• **Improve moisture retention**

This helps increase skin turnover to naturally restore itself .moisture retention helps stop dryness and promote lipid balance.

• **Improve the skin barrier**

Because butterfly pea flower contain plant based antioxidants and antioxidants vitamin such as vitamins ,it help improve skin barrier

• **Suitable for all skin type**

Butterfly pea flower is a hidden skin care rockstar. It is gentle enough for use on all skin types ,no matter what time of year it is.

• **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 ,antifungal and antiviral properties which prevents free radicals from causing damage to the skin . coconut oil has anti-inflammatory properties which reduce redness on skin this can be helpful for both dry and oily skin conditions by reducing inflammation of the skin.



• **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 your 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 keep



• **Vitamin E Capsule.**

Vitamin E it provides extra protection against acute UVB damage and protect against 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 its benefits of skin health and appearance.it has antioxidant and anti-inflammatory properties.



❖ **Formulation of sunscreen cream**

➤ **Formulation of butterfly pea flower extract:**

To make an extract of butterfly pea flower for herbal sunscreen ,steep about a dozen fresh or dried flower leaves in a cup of boiling water . After about 15minutes ,strain the liquid and discard the leaves . The deep blue water is then ready to be used in Sunscreen cream.

➤ **Butterfly pea flower contain**

Soluble minerals	8.94mg
Ash.	0.9mg
Crude protein.	41.27mg
Soluble carbohydrates.	29.18mg

➤ **Formulation of sunscreen cream was prepared by following procedure -**

I have to take butterfly pea flower extract.then I have take aloe vera gel because it has proven to both treat and prevent burns on skin. Then added rose water in mixture rose water provide cooling effect.then gradually add coconut oil and vitamin E.all the ingredients were mixed vigorously using spatula for about 20-30min and placed .

➤ **List of ingredients used in formulation**

Aloe vera.	5 gm
Rose water.	2ml
Butterfly pea flower Extract.	4gm
vitamin E.	2gm
coconut oil.	2ml

➤ **Final Product**



❖ **Evaluation of sunscreen cream for suncreening 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 the product between 290-320nm at every5nm intervals .SPF can be calculated by applying the following formula known as Mansur equation.

- **SPF** spectrophotometric= $CF \times EE(\text{wavelength}) \times I(\text{wavelength}) \times \text{Abs}(\text{wavelength})$

Where CF=correction factor (10), EE=erythmogenic effect of radiation with wavelength,

Abs=spectrophotometric absorbance values at wavelength.

The value of $EE \times I$ constants.

- **PH of the cream :** The ph meter was calibrated using standard buffer solution.about 0.5 of the cream was weighed and dissolved in 50.0ml of distilled water and its 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 applicationof fixed amount of cream was checked.

- **Type of smear:**

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

➤ **Types of skin and SPF**

Types.	Description	SPF.	Character
1	Always burn easily. And never tans	More than 8.	Sensitive
2	Always burn andtan. Minimally	6-7.	Sensitive
3	Burn moderatory and. Tan gradually	4-5	Normal
4	Burn minimal and. Always tan well	2-3	Normal
5	Barely burn and tan. Profusely	2	Insensitive
6	Never burnand. BecomedeeplyPigmented	None	Insensitive

➤ **Observations**

Sr.No.	Parameters	Observation
1	Colour	Light Blue
2	Odour	Characteristics
3	Spreadability	Good and uniform
4	PH	6.5
5	Test for Irritancy	No.irritation reation

➤ **Benefits of sunscreen**

- Reduce risk of skin cancer
- Protect against sunburn

- Avoid inflammation and redness
- Avoid blotchy skin and hyperpigmentation
- Stop DNA damage .
- Prevent the early onset of wrinkles and fine lines
- Lower skin cancer risk
- Shields from harmful UV rays
- Maintain the brightness of your natural complexion
- Maintain the look and texture of your skin
- Delays premature signs of aging
- Reflects UVA and UVB rays
- Works immediately when applied on the skin.

➤ **Advantages**

- Easily available
- No side effects
- No special equipment needed for preparation
- They are inexpensive
- Ingredients are easily available
- Renewable resources
- Be non toxic and non irritant
- Be neutral
- Be stable to heat
- Easy to manufacture

➤ **Disadvantages**

- They are difficult to hide taste and odour
- Manufacturing process are time consuming and complicated
- Herbal drug have slow effects as compare to allopathic dosage form it also requires long term therapy.

IV. AIM AND OBJECTIVE

AIM: - Formulation and evaluation of sunscreen cream containing natural and synthetic agents

OBJECTIVE:

- To develop sunscreen formulation using herbal ingredients
- To perform physicochemical characterization
- To achieve maximum stability of formulation
- To achieve maximum UV protecting effect
- To develop various formulation
- To inhibit the transmission of UV radiation into the skin
- To reduce the risk of squamous cell and melanoma skin cancer
- To diminish the degree of baseline pigmentation

V. PLAN OF WORK

1. Literature Review
 2. Material and Instruments
 3. Experimental method
- Sample collection
 - Identification tests

- Make extraction of Curcuma longa (turmeric) powder
- Filter out the extract
- Evaluation tests
- Physical parameter
- Determination of pH
- Determination of Viscosity
- Spreadability
- Washability
- Homogeneity
- Stability Testing
- Determinatio

VI. MATERIAL AND METHODS

CHEMICALS AND REAGENTS

Table 2: Chemicals and reagents

Sr. NO.	CHEMICALS
1.	Ethanol
2.	Stearic acid
3.	Cetyl alcohol
4.	Triethanol amine
5.	Hydroxyl propyl methyl cellulose
6.	Glycerine
7.	Propyl Paraben
8.	Carbopol 940
9.	Rose water
10.	Rose Oil
11.	Coconut oil
12.	Vitamin E
13.	n-propyl alcohol
14.	Distilled water
15.	Conc. Sulphuric Acid
16.	DragonDroff's Reagent
17.	Ferric Chloride
18.	Molish Reagent
19.	Ninhydrine
20.	Silica gel

The various chemicals used throughout the experimental work are summarized.

Table 3: Instruments

Sr. no.	INSTRUMENTS	BRAND NAME
1.	Analytical balance	Contech
2.	Digital pH meter	Systronics digital pH meter 345
3.	Brook field Viscometer	DV-I, LV-I spindle, USA
4.	Digital autoclave	ASI-254
5.	UV spectrophotometer	UV 1700, Shimadzu, Japan

➤ **IMPORTANCE OF SUNSCREEN:**

UV radiation is essential to human health such that it helps in the intestinal absorption of calcium, phosphorous and for the production of vitamin D3. On the other hand, these radiations also harm our health by directly interacting with DNA, RNA proteins, lipids and thereby causing potential carcinogenic effects. 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, dermatologist Anna Chien addresses common concerns.

VII. DISCUSSION

The Most apparent acute benefit of currently available sunscreen is the prevention of sunburn from UVR exposure. This effect has been suggested to be both a benefit and a potential and concern. The obvious benefit is the prevention of sun burn that may reduce the risk of non-melanoma and perhaps melanoma skin cancers because severity and frequency of sun burn.

The study attempted to develop herbal sunscreen cream using extract of rosemary and examined their efficacy for preventing sun burn. The purposed UV spectropotometric method is simple, rapid uses low-cost reagent and can be used for in vitro determination of SPF values in many cosmetic formulation. It can perform both during production process, on final

VIII. SUMMARY

Promoting sunscreen use is an integral part of prevention programs aimed at reducing UV radiation induced skin damage and skin cancers. Protection against both UVA and UVB advocated. The used spectrophotometric method, to calculate SPF is an inexpensive and easy to apply. The SPF is a quantitative measurement of the effectiveness of a sunscreen formulation. To be effective in preventing sunburn and other skin damage, a sunscreen product should have a wide range of absorbance between 290-400nm. In this research sunscreen cream containing ethanolic extract of flower of *Rosmarinus officinalis* and *S. lycopersicum* evaluated by UV spectrophotometry.

From the result obtained in the study we can positively conclude that *R.officinalis* sunscreens have significant UV absorbing property. It will also help in broadening the UV protection ability of the conventional sunscreen formulation. The present work focus on the scientific amount of herbal in cosmetic. Active constituents extracted from herbals have a potent UV shielding effect.

IX. RESULT

To be effective in preventing sunburn and other skin damage, a sunscreen product should have a wide range of absorbance .during the storage and handling of cosmetic formulation spreadability and viscosity are the prime parameter which affects the formulation acceptability. the formulated cream exhibited no redness, inflammation and irritation .when formulation were kept for long time ,it found that no change in colour of cream .The cream was easily removed by washing with tap water .

X. CONCLUSION

The study attempted to develop sunscreen cream using extracts of *Rosmarinus officinalis*, *Curcuma longa* and *Solanum lycopersicum* and examined their efficacy for preventing sunburn. It can be stated that the current

study will hopefully lead to improvements in the treatment of sunburns produced by UV radiation exposure.

The study also demonstrates that UV Spectroscopy is the most efficient, acceptable, and repeatable approach for determining the performance of herbal sunscreens. The formulations F1,F2 and F3 were prepared by varying the composition and evaluated for their physical-chemical properties and SPF

The Study showed that Formulation F3 was found to be more stable with high SPF value, Proving a better sunscreen cream. The use of sunscreen is an important component to sun protection. Regular and appropriate use is associate with a decreased risk of various skin complication and cancers as result of radiation exposure. In addition patient need to be reminded not to solely rely on the use of sunscreen. Thus it can be concluded that there is great market potential for sunscreen chemicals either synthetic or natural or in combination due to awareness of protection from hazardous UVA as well as UVB rays

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