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DEVELOPMENT OF AN HERBAL SUNSCREEN USING NATURAL PLANT

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ABSTRACT

The sunlight is harmful Radiations that affect the skin. The Ultraviolet radiations are of types Ultraviolet A, Ultraviolet B, and Ultraviolet C. This article gives a detailed review of different types of Ultraviolet radiation. To protect our skin from Ultraviolet radiation sunscreen formulations are used which either absorb scatters or reflect the radiation. The harmful effects on the skin like photoaging, skin cancer, and DNA damage are explained. The present review explains the various types of sunscreen formulations and the agents used for sun screening. The agents are of two types physical and chemical sun screening agents. The physical agents that block the sunlight and the chemical agents that absorb the sunlight are listed and explained. To know the efficacy of the formulation sun protection factor calculation is done. The equation used to calculate the Sun Protection Factor value is explained in detail. The ultraviolet spectroscopic method is employed to calculate the Sun Protection Factor. The proposed method is found to be easy and rapid for the calculation of Sun Protection Factor values in the in vitro studies. The herbal formulation is more advantageous than the chemical formulation because of its fewer side effects. Few herbal sunscreen agents are listed and explained in their activity.

KEYWORDS*: UV radiations, Sunscreen agents, Sun Protection Factor, Herbal sunscreens*

1. INTRODUCTION

Sunscreens are those agents that absorb, scatter, or block UV radiation They control the deleterious effects like premature aging which can lead to sagging, wrinkling, and hyperplasia associated with UV radiation. The active ingredients used in Sunscreen preparation are divided into Organic and Inorganic filters based on the mechanism of action and chemical composition. Organic filters absorb the UV radiation while Inorganic filters protect the skin by scattering and reflecting UV radiation These agents are found as over-the-counter products in supermarkets and pharmacies, even sold by physicians in the USA directly, in Italy by hospitals and in Australia Cancer charities and Cancer Control Organisation. The largest organ of the body is the skin which covers 15% of the total body mass of an adult. The integument is an outer covering of skin which is derived from the Latin word integere. The skin not only varies from one individual to another but it varies because of the geographical location and concerning color, texture, thickness of the skin layers, and adrenal structures like sweat glands, sebaceous glands, and hair follicles.

Skin structure consists of mainly layers:
- Epidermis
- Dermis
- Hypodermis

Functions are different from one another They mainly protect from pathogens, UV light, chemicals, and injury because of their structure made up of an intricate network that acts as a barrier. It also regulates the temperature and amount of water released into the external environment Sunlight is an electromagnetic radiation of continuous spectrum which is divided into three main spectrums of wavelength:

- Ultraviolet
- Visible
- Infrared Ultraviolet (UV) radiation is further divided into three ranges

(a) UV-A (320-400 nm),
(b) UV- B (280-320 nm),
(c) UV-C((200-280 nm) among

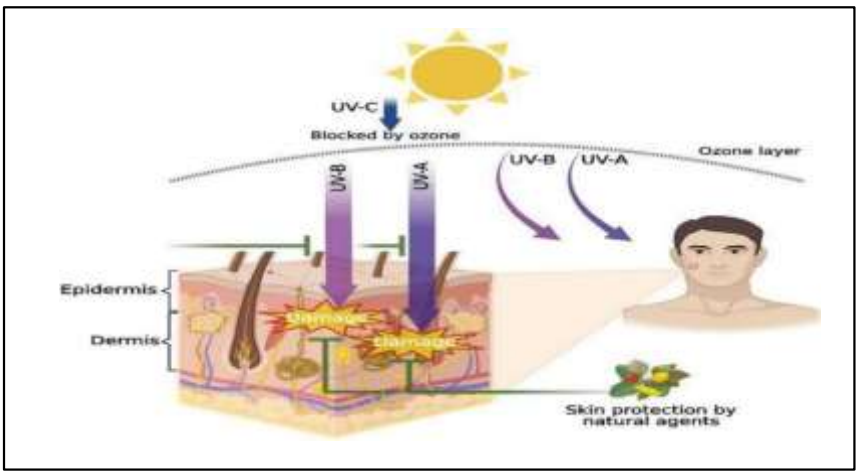


Fig No. 1 : SKIN

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UV-A has the highest wavelength and less energy, UV-C has high energy and shorter wavelength while UV-B remains in the mid-range. Around 80-90% of UV-A and 1-10% of UV-B reach the earth's surface while UV-C gets absorbed into the earth's atmosphere·UV-A can penetrate to deeper layer dermis and it can damage DNA by indirect photosensitizing reaction by the production of reactive oxygen species.

UV-B reaches to epidermis layer and is absorbed by DNA which results in molecular rearrangements forming photoproducts like cyclobutene dimers and pyrimidine (6- 4) pyrimidine (6-4 photoproducts) as shown in Figure 1 and UV-C gets absorbed into the ozone layer of the earth's stratosphere, exposure is a main reason for age-related changes such as the development of skin cancer because of the skin's anatomic location at the external part of the body, To overcome this problem. Sunscreen Agents are used.

Ideal Properties of Sunscreen Products

- Sunscreen should absorb a broad range of UV spectrum to protect the skin from UV rays.
- There should be no chemical breakdown which will result in decreased inefficacy or increased toxicity or irritation because of by-products.
- It should have suitable properties while formulating with a cosmetic base and it penetrate the skin easily.
- For effective results, frequent re-application of sunscreens should not be required. At low concentrations, it should be effective. It should not irritate, sensitization.

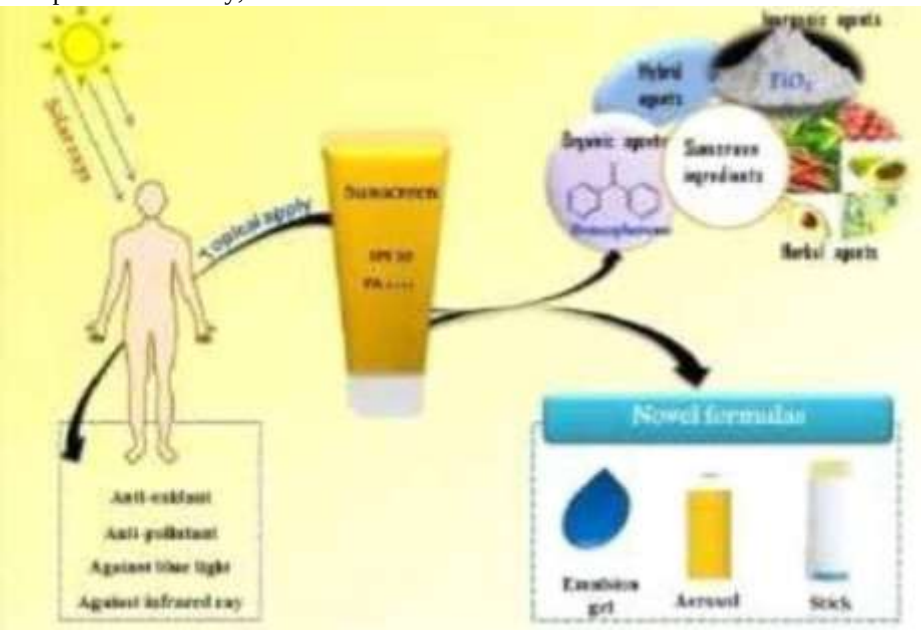


Fig. No. 2

2. AIM AND OBJECTIVES

AIM : Preparation Of Herbal Sunscreen.

OBJECTIVES

1. **Protect skin from UV rays**
   Herbal sunscreens block, absorb, or scatter the sun's ultraviolet A and B radiation to prevent skin damage and premature aging.
2. **Reduce the risk of skin cancer**
   Herbal sunscreens can help lower the risk of skin cancer by reducing sunburn and other skin damage.
3. **Avoid chemical sunscreens**
   Herbal sunscreens are an alternative to chemical sunscreens, which can cause skin discomfort and itchiness.
4. **Provide other skin benefits**
   Herbal sunscreens can also hydrate the skin, tighten pores, prevent acne, fade scars, and lighten dark circles.

3. LITERATURE SURVEY

1. Yangmyung Ma ,*et al*..(2021) :

With the global sunscreen market expected to reach $24.4 billion worldwide by 2029, this demonstrates the increasing awareness of the damaging effects of sunlight. Sunscreen has been gradually evolving, and new photoprotective ingredients are continuing to be produced in response to growing scientific evidence on the effect of solar radiation on the skin. This literature review aims to provide an updated view of the history of sunscreens. A literature search was conducted with the keywords Sunscreen, history regulation, ultraviolet A, ultraviolet B, visible light from PubMed, Medliine and online search engines.

2. Leslie K Dennis, *et al* ..(2003):

Originally developed to protect against sunburn, sunscreen has been assumed to prevent skin cancer. However, conflicting reports include claims that sunscreen increases the risk of melanoma.

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4. CLASSIFICATION OF SUNSCREEN

Classification of sunscreen agents is based on the composition and mechanism of action shown in Sunscreen agents work by different methods by blocking, reflecting, and scattering the UV radiation.

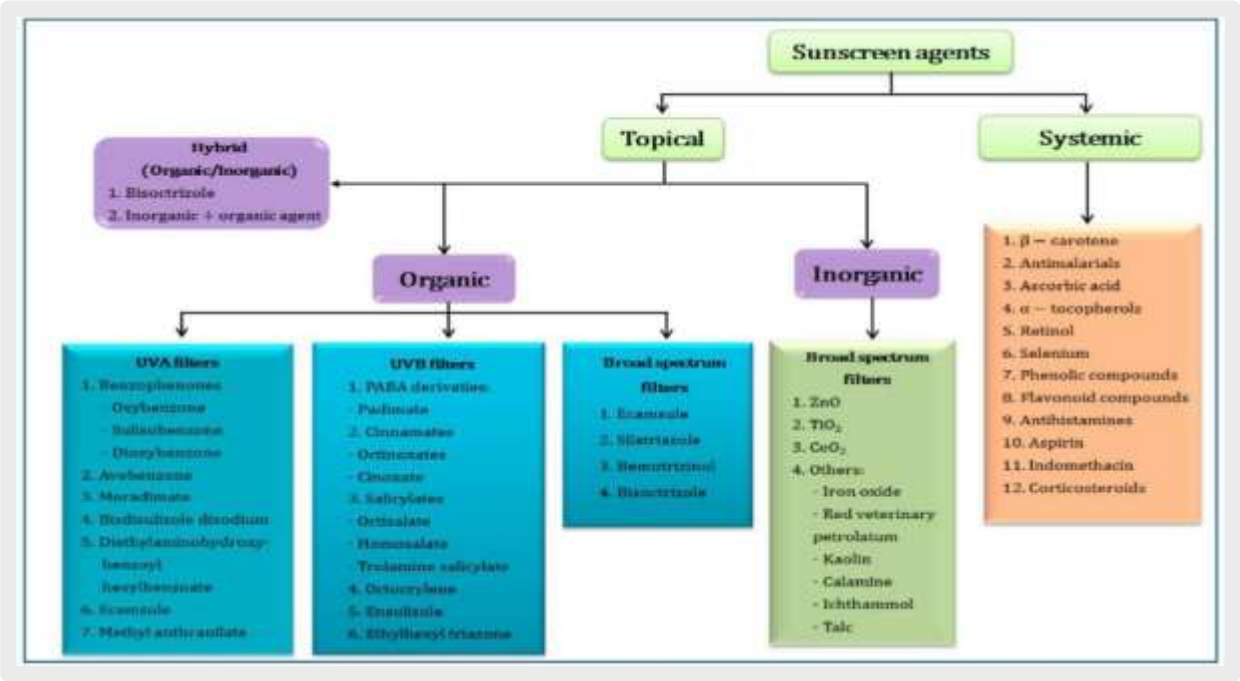


Fig No. 3 : Classification Of Sunscreen Agents

4.1. Organic Sunscreens

These are generally aromatic compounds linked with a carbonyl group. They are broadly classified into three categories based on the range of protection; UVB (290 320 nm) and UVA (320–400 nm) and broad-spectrum sunscreens that cover the entire spectrum (290–400 nm) (GA Bard, 2009). Examples of organic sun-screens covering UVB include (PABA) and its derivative padimate O. salicylates including octisalate and homosalate, cinnamates including octinoxate and cinoxate, octocrylene, benzylidene, and dibenzoyl menthanes. UVA filters includebenzophenones; oxygen- zone and sulisobenzone, avobenzone and eradicate, Methyl anthranilate,and ecamsule. Broad-spectrum organic filters that cover both UVA and UVB include besoctrizole,and silatriazole among others.



Fig No. 4: Organic Sunscreen Creams

4.2. Inorganic Sunscreens

These are particles that scatter and reflect UV rays to the environment. They act as a physical barrier to indent ultraviolet and UV light. The most commonly used particulate sunscreens are (titanium dioxide and zinc oxide). They are considered broad spectrum as they cover the entire ultraviolet spectrum. The inorganic sunscreens are also referred to as sunblocks, a term coined from their mechanism of photoprotection.

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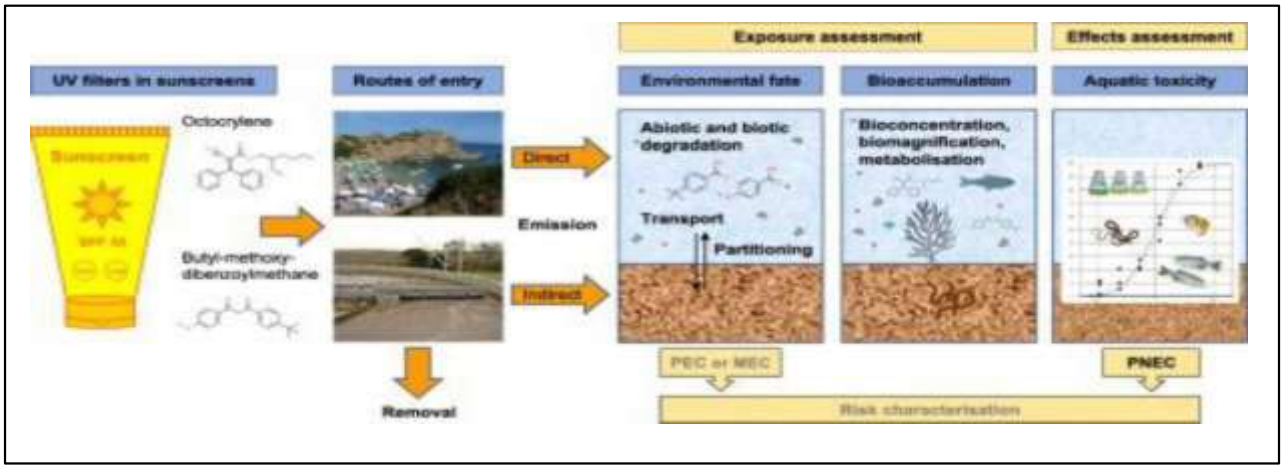


Fig No. 5: Inorganic Sunscreen

4.3. Systemic Sunscreens

These are sunscreens that are absorbed into the body and accumulate in the skin affording protection from the UV rays. Common examples under this category are. The use of systemic sunscreens for daily routine is minimal, as such the focus of this article is topical sunscreens as these predominate in the market. Sunscreens act by preventing and minimizing the damaging effects of the ultraviolet sun rays following exposure to the sun. Sunscreens have been demonstrated to increase the tolerance of the skin to UV exposure.

Mechanism Of Photoprotection

Mechanisms As Detailed Give A Pictorial Perspective Of The Mechanisms Of Action Stated. Scattering And Reflection Of Uv Energy From The Skin Surface. Mineral-Based (Inorganic Sunscreens Work Primarily Through This Mechanism. They Provide A Coating That Blocks Sun Rays From Penetrating Through The Skin (Dransfield, 2000).

Absorption Of The Uv Energy By Converting It To Heat Energy Thus Reducing Its Harmful Effects And Reducing The Depth Through Which It Can Penetrate The Skin. Organic Sunscreens Work Primarily Through This Mechanism (Dransfield, 2000;)Lademann Et Al., 2005; Manaia Et Al., 2013)

Benefits Of Sunscreen

- ✓ Reduce the 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 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 is needed for the preparation
- ✓ They are inexpensive
- ✓ Ingredients are easily available
- ✓ Renewable resources
- ✓ Be non toxic and nonirritant
- ✓ Be neutral
- ✓ ✓Be stable to heat
- ✓ Easy to manufacture

Disadvantages

- ✓ They are difficult to hide taste and odor.
- ✓ Manufacturing processes are time-consuming and complicated.
- ✓ Herbal drugs have slow effects as compared to allopathic dosage forms it also requires long-term therapy.

6. THE MAIN ROLE OF INGREDIENTS USED IN FORMULATION

Aloe vera is a good active ingredient to reach in the Sunscreen arsenal. It has been proven toboth treat and prevent burns on your skin The leaves of aloe vera and A. Barbadensisare 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 maintains the skin's natural moisture balance. It stops the sunburn and stimulates immune system intervention. Aloe vera gel can be used to help with the healing process of sunburn it helps relieve pain and redness by reducing.

Inflammation of the gel also stimulates the production of collagen which helps the healing process.

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Fig No. 6: Aloe vera (*Aloe barbadensis)*

6.1. Butterfly Pea Flower

Packed with antioxidants

Butterfly pea flowers contain many antioxidants such as flavonoids anthocyanins and polyphenols. Your skin needs antioxidants to improve general health and elasticity. Antioxidants help to minimize fine lines and improve your skin and appearance. Butterfly pea flower helped calm itching and general irritation. The butterfly pea flower is used for use in rejuvenating the skin.



Fig. No. 7

Reduce Redness

Because of butterfly pea flowers' ability to soothe irritated skin, it also minimizes redness caused by acne. Dryness, and general irritation.this 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 flowers contain plant-based antioxidants and antioxidants vitamin such as vitamins, they help improve the skin barrier.

Suitable For All Skin Types

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.

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A) Coconut Oil



Fig. No. 8 : Coconut Oil

Coconut oil keeps the skin soft and smooth while preventing premature aging of the skin. Coconut oil for skin use as a moisturizer removes dead skin cells. Coconut oil moisturizes dry skin including in people with conditions such as eczema. Promoting wound healing it has antibacterial, antifungal, and antiviral properties which prevent free radicals from causing damage to the skin coconut oil has anti-inflammatory properties which reduce rednees on the skin this can be helpful for both dry and oily skin conditions by reducing inflammation of the skin.

B) Rose Water



Fig. No 9: Rose Water

Rose water contains vitamin B which is often used in Sunscreen and sun products .it helps to bolster the effectiveness of SPF .rose water can be used to lighten skin pigmentation. Rose water can remove oils and dirt from your skin by unclogging your pores. It helps maintain the pH level of your skin. It is a hydrating and nourishing agent for the skin and protects the skin against harmful environmental aggressors, Gulab Jal has antioxidant levels that tackle freeradicals and keep skin healthy and glowing

C) Vitamin E



Fig. 10: Vitamin E

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Vitamin E provides extra protection against acute UVB damage and protects against cell mutation caused by sun and pollution exposure. Vitamin E helps cleanse your skin removing impurities and helping improve skin elasticity Vitamin E combination with lemon juice helps to whiten the skin. It is most commonly known for its benefits of skin health and appearance. It has antioxidant and anti-inflammatory properties.

7. FORMULATION OF SUNSCREEN

7.1 Formulation Of Butterfly Pea Flower Extract

Sr. No	Ingredients	Quantity Taken
1	Soluble Minerals	8.94mg
2	Ash.	0.9mg
3	Crude Protein.	41.27mg
4	Soluble Carbohydrates	29.18mg

Table No. 1 List Of Ingredients Used In The Formulation

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 15 minutes, strain the liquid and discard the leaves. The deep blue water is then ready to be used in Sunscreen cream.

7.2 Butterfly Pea Flowers Contain

Formulation Of Sunscreen Cream Was Prepared By Following The Procedure

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

Final Product



Fig. No. 10: Final Product Formulation.

After feel: Emolliency, slipperiness, and amount of residue left after the application of the fixed amount of cream was checked**.**

8.EVALUATION OF SUNSCREEN CREAM FOR SUN SCREENING ACTIVITY EFFECTIVENESS OF SUNSCREEN

The effectiveness of sunscreen is usually expressed by the sunscreen protection factor (SPF), which is the ratio of UV energy required to produce a minimal erythemal 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 every interval.SPF can be calculated by applying the following formula known as the Mansur equation.

SPF

$$[spectrophotometric = CF \times \epsilon EF(wavelength) \times I(wavelength)] \times Abs(wavelength)$$

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Where
CF = Correction Factor,
EE = Erythmogenic Effect Of Radiation With Wavelength,
Abs = Spectro Photometric Absorbance Values At Wavelength.
The Value Of EE×I Constants.

PH Of The Cream
The pH meter was calibrated using a 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 homogeneity by visual appearance and by touch. Appearance: The appearance of cream was judged by its color, pearl science, and roughness and graded.

Removal
The ease of removal of the cream applied was examined by washing the applied part with tap water.
After the application of cream, the type of film or smear formed on the skin was checked.

Result
To be effective in preventing sunburn and other skin damage, a sunscreen product should have a wide range of absorbance during storage and Handling of cosmetic formulation spreadability and viscosity are the prime parameters that affect the formulation acceptability. The formulated cream exhibited no redness, inflammation, or irritation When the formulation was kept for a long time, it found no change in the color of the cream. The cream was easily removed by washing with tap water.

9.CONCLUSION
The study attempted to develop an herbal sunscreen cream using an extract of butterfly pea flower and examined their efficacy for preventing sunburn.

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