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FORMULATION AND EVALUATION OF HERBAL SUNSCREEN CREAM

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Abstract

Sunscreen is a chemical compound that help to protect UV rays. Although ultraviolet B light causes sunburn, ultraviolet A may be more harmful to the skin. The occurrence of actinic keratosis, squamous cell carcinoma, and melanoma is decreased by routine sunscreen use. Chemicals in sunscreen can be either organic or inorganic. Sunscreen use has increased as a result of the rising incidence of skin cancer and the photo damaging effects of UV light. [1]

The plant's antioxidant, anti-inflammatory, antiseptic, and antibacterial qualities, among others, are used to protect skin from various pathogens. Sunscreens should be completely able to protect the skin from sun damage and should be chemically inert, non-irritating, non-toxic, photo stable and safe. [2]

The sun's UVA and UVB radiation cause skin cells to get damaged as a result of the skin producing reactive oxygen species. In order to effectively prevent photo aging and skin cancer, sunscreen should also contain antioxidant agents. [1] An herbal sunscreen cream is made using plant extracts, such as Triticum aestivum L. (wheat grass), Vit E and the polyphenolic drug. [2, 3]

Keyword:-Herbal sunscreen, SPF, Triticum aestivum, sun protective, skin burn.

Introduction

Sunscreen is also referred to as sunblock cream; that is applied to the skin to shield it from the sun's damaging rays and avoid sunburn. Sunscreen is a chemical substance that helps shield you from UV radiation, which is what causes sunburn. [1, 2]

Based on a combination of medical plants and some fixed oils, sunscreen formulation. Sunscreen can be an organic or inorganic spray gel or other topically applied solutions that reduce sunburn and other skin damage while protecting the skin from the sun's UV rays. The sun's UVA and UVB radiation cause skin cells to get damaged as a result of the skin producing reactive oxygen species. [1, 2]

There are two categories of sunscreen;

Physical sunscreen – Those that reflect the sunlight.

Chemical sunscreen – Those that absorb the UV light.

Only external usage is permitted for sunscreen agents. The application of sunscreen to provide UV protection. The sunscreen formulation's capacity to prevent UV-induced sunburn and its chemo preventive activity determine how well it will shield the treated region from sunburn when applied topically. The generation of Reactive Oxygen Species (ROS), which interact with proteins and lipids and subsequently modify them, is the primary mechanism of skin damage by UV radiations. The sun's ultraviolet rays UVB and UVA, to a

lesser extent, cause skin damage. [1] Sunscreen should contain antioxidant agent in addition to sunblock agent to be successful in protection of photo ageing and skin cancer.

Classification of sunscreen:-

Sunscreen are classified as topical or systemic based on the route of administration. Topical sunscreen is further separated into two types based on its mechanism of protection.

Organic sunscreen- Organic sunscreen works by absorbing into the skin and converting UV radiation into heat. Organic sunscreen actives chemical carbon compound.

Inorganic sunscreen- These are particles that scatter and reflect UV rays. They act as physical barrier to UV light.

Mechanism of Photo Protection:-

Sunscreen act by prevent the skin from UV exposure. They works on two different mechanisms:

UV radiation from the skin surface is scattered and reflected by mineral-based, inorganic sunscreen work on this mechanism by prevents sun rays from the skin surface.

Organic sunscreen works on this mechanism by absorbing UV energy and converting it into heat energy thus reducing its harmful effects and the depth to which can penetrate the skin.

Sunscreen protection factor (SPF):-

Sunscreen protection factor (SPF), which is the ratio of UV energy needed to create a low erythema dose in protected skin to unprotected skin, is typically used to express sunscreen. Screening the product's absorbance between 290 and 320 nm at intervals of 5 nm is an easy, quick, and accurate in vitro way of determining the SPF.

SPF can be determined by using the following formula,

$$\mathbf{SPF = CF \times \sum EE\ (wavelength) \times I\ (wavelength) \times Abs\ (wavelength)}$$

Where,

CF – correction factor
EE- erythmogenic effect of radiation with wavelength,
Abs – spectrophotometric absorbance values at wavelength,
Values of EE ×I are constants.

Materials and method

Introduction of wheat grass plant:-

Biological source: Triticum Aestivum L
Family: Gramineae.

Vitamin, mineral, and phenolic compounds, have antioxidant activity. It contains a lot of chlorophyll, active enzymes, vitamins A, B, C, D, E, and K, potassium, iron, magnesium, sodium, sulphur, and 17 different types of amino acids in the form of fresh juice.

Importance of Wheat grass Juice:-

A nutrient-rich superfood with high quantities of antioxidants, vitamins, and minerals is wheatgrass. According to certain research, wheat grass extract may have anti-inflammatory and anti-aging actions that could be beneficial for the skin. Wheat grass juice use to be herbal sunscreen cream because of to prevent the sunburn and skin damage.

Vitamin E capsule:-

Vitamin E provides extra protection against acute UVB damage and protect against cell caused by sun and pollution exposure. It helps to cleanse your skin and removing the impurities 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.

Importance of Polyphenolic drug:-

Polyphenolic drug rutin is used to the herbal sunscreen cream. It benefits for skin health and appearance.Polyphenolic drug has most potent in antioxidant activity use to the protect the skin and skin cancer. It's another activities of anti-inflammatory, antiseptic and antibacterial activity to protect the skin from pathogens. It should be completely able to protect the skin from sun damage should be chemically inert, nontoxic and photostable.

Preparation of extract

Maceration method is selected for extraction of wheat grass juice; in which 10 ml extract was suspended in 40 ml of ethanol and 60 ml of distilled water and kept for maceration in conical flask for 48 hours at room temperature. The supernatant was evaporated and then filtered using whattsman filter paper. The viscous substance was kept in a clean, airtight container. The leftover material was dried and then used for more extraction.

Table no.1

Physicochemical test

Sr.no	Chemical test	Observation	Inference
I.	**Carbohydrate test-**		
1.	Fehling's reagent test	Red colour	Carbohydrate present
2.	Benedict's test	Blue to brick red colour	Carbohydrate present
II.	**Amino acid test**		
1.	Ninhydrin test	Purple colour	Amino acid present
III.	**Alkaloid test**		
1.	Hager's test	Yellow colour	Alkaloid present
2.	Wagner's test	Reddish colour	Alkaloid present
3.	Dragendroffs test	Orange test	Alkaloid present
4.	Mayer's test	Yellowish white	Alkaloid present
IV.	**Phenolic tannin test**		
1.	Potassium dichromate reagent	Red colour	Tannin present
2.	Ferric chloride test	Greenish black	Phenolic and tannin present
3.	Iodine test	Yellowish red	Tannin present
4.	Lead acetate test	Yellowish white	Tannin present
V.	**Acid value test**	Faintly pink	Amount of acidity
VI.	**Saponification value**	Pink colour	Amount of ester linkage

Determination of total phenolic content

Reagent:-Dilute Folin-ciocalteu reagent with equal volume of distilled water. 20% Sodium carbonate in water, and Gallic acid.

Procedure:-

Prepare a standard Gallic acid solution (10-100µg/ml in water) and 1 milligram/ml of extract solution. Mix 1 ml of 20% sodium carbonate solution. Allow the mixture to react for 40 min. at room temperature. After the completion of reaction process measure the blue color at 725 nm in colorimeter. Calculate the amount of total phenols from calibration curve as a Gallic acid equivalent by the following formula.

$$T=C\times V/ M$$

Where,

T= total content of phenolic compound, (milligram per gram of plant extract),

C= the concentration of Gallic acid established from the calibration curve (milligram per milliliter),

V= the volume of extract (milliliter) and M is the gram weight of plant extract.

Formulation of herbal sunscreen cream

Procedure:-

The required quantity of stearic acid, propylene glycol, glycerine, triethylamine was taken in the beaker. (Oil phase) In another beaker aqueous extract and polyphenol solution in methanol. (Water phase) Heated both beaker on water bath at 65-70 c.The oil phase was taken in a mortar pestle and to it added the water phase with trituration until a smooth cream was formed then added Vitamin E and mix well.

Table no.2

Formula for herbal sunscreen cream formulation

Sr. no	Ingredients	Qty. taken	Role
1	Stearic acid	6 gm	Free fatty acid
2	Propylene glycol	4 ml	emollient
3	Glycerin	3 ml	emollient
4	Triethylamine	1 ml	Surface active agent
5	Vitamin E	2 capsule	moisturizer
6	Extract	12 ml	Aq. phase
7	Polyphenolic Drug	1.5	Antioxidant and anti-inflammatory

Evaluation test

Table no.3

Physical parameter

Sr. No	Parameters	Observation
1	Appearance	Cream
2	Color	Yellowish
3	Texture	Smooth
4	Consistency	Good
5	Test for irritancy	No irritation reaction

PH Determination:-

Procedure: -

All the formulation were water in oil semisolid emulsions. The PH meter was calibrated using standard buffer solution. About 1 gm of the cream was weighed and dissolved in 10 ml of distilled water and its PH was measured.

Homogeneity:-

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

Spreadability:-

Procedure:

The 10 gm weight was securely fastened to the upper slide. The amount of time needed for the upper slide to move 5 cm and then separate from the lower slide under the influence of weight was recorded. Three repeats of the experiment were conducted, and the mean obtained for these three dimensions was determined.

Formula:-

$$\text{Spreadability (S)} = M \times L/T$$

Where,

S=Spreadability,

L=Length of glass slide,

T=Time,

M=Weight tied to the upper slide.

Irritancy test:-

The cream was applied to the skin surface and time was noted. Irritancy, erythema, edema, was checked if any for regular intervals up to 24 hrs. and reported.

Thermal stability:-

The cream is stored at various temperature range i.e;25 c, 30 c, 37 c, 40 c.It observed for physicochemical properties. It should not be oil phase separation in cream. They are thermally stable.

Sun protection factor:-

Procedure:-

The 1gm of cream was weighed and transferred to a 100 ml volumetric flask, and then diluted with ethanol and water (40:60). Following the dilution, ultrasonification was performed for 5 minutes, and the filtrate was collected after the first 10 ml of filtrate were ejected. A volumetric flask of 50 ml was filled with 5.0 ml of an aliquot, which was then diluted to volume using ethanol and water (40:60). After that, 5.0 ml of the aliquot was transferred to a 25 ml volumetric flask and the volume was finished with a 40:60 ratio of ethanol and water. Each produced aliquot's absorbance values were measured from 290 nm to 320 nm at 5 nm intervals using a blank solution of distilled water.

Result

A sunscreen product should have a wide range of absorbance to be helpful in preventing sunburn and other skin harm. Spreadability, homogeneity, thermal stability, and pH are the factors that affect the formulation's acceptability throughout storage and handling of the product. The cream's formulation lacked any redness, inflammation, or irritation. When a formulation was stored for a long time, there was no noticeable change in the cream's colour. Washing with tap water made it simple to get rid of the cream.

The formulation has a pH between 7 to 9.The herbal sunscreen cream has a smooth texture and consistency. The spreadability of the cream formulation was assessed, and this shows that the cream spreads well when applied to the skin. Estimation of the total polyphenolic compounds in produce formulation. It can provide antioxidant activity. The SPF value of herbal creams achieved by carrying out the UV spectrophotometry technique.

Table no.4

SPF Determination of formulation of herbal sunscreen cream

Wavelength(nm)	EE×I	Abs	EE×I×Abs
290	0.15	1.3258	0.1988
295	0.817	1.1745	0.9595
300	2.874	1.0983	3.1565
305	3.278	1.0506	3.4438
310	1.864	1.0133	1.8887
315	0.839	0.9848	0.8262
320	10	0.9658	9.658
SPF Total			**=20.1315**

Table no .5

Summary of various pharmaceutical evaluation parameters

Parameters	Observation
Appearance	Cream like
Emulsify type	W/O
Test for irritancy	No irritation reaction
Phase separation	No phase separation
Homogeneity	Uniform &homogeneous
PH	8.05
Photo stability	Good
Spread ability	15
SPF	20.13

Conclusion

Sunscreen are extensively used to prevent UV induced skin damage including sunburn, early aging, and skin cancer. Natural or herbal sunscreen are preferred because of being enriched product. They are the flavonoids and polyphenols, exhibited high sun protective capacity. The wheat grass plant extract, Vit E and Polyphenolic drug has been used in preparation of sunscreen cream. The prepared cream is found to have best physicochemical properties and highest SPF value.

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