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(RESEARCH ARTICLE)

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Formulation development and evolution of sunscreen lotion

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Abstract

The formulation of sunscreen salve incorporated essential oil. The sunscreen activity of lotion was assessed using the in vitro SPF procedure. The SPF represents a quantitative evaluation of the efficacy of sunscreen formulations. It was determined that the sunscreen lotion had an SPF value of 16.09457. Sunscreens with an SPF value greater than 2 are regarded as having effective sunscreen properties. This suggests that the formulated sunscreen lotion exhibited excellent sunscreen activity, suggesting that herbal oil, extract, and juice could potentially be effective alternatives. regarded as a suitable candidate for use in cosmeceuticals or sunscreen. Additional characteristics of this lotion that were assessed included spreadability, viscosity, pH, and extrudability.

Keywords: Sunscreen; Evolution; SPF; Essential Oil; Efficacy

1. Introduction

The ultraviolet rays coming from the sun are one of the major cause of various skin problems such as sunburn, dark spots, premature ageing of skin and skin cancer etc. Hence one needs some kind of protection from these harmful radiations. The best method of protection from the harmful radiations of sun is the use of formulations made out of natural source mainly plants. The antioxidant property of the herbs makes them efficient to protect the skin against the damage caused by ultraviolet radiations. The free radicals scavengers are the main cause of several skin disorders, antioxidants present in herbs play a vital role in fighting against these free radicals.

Cosmetic products are applied on the body for the purpose of nourishing, cleansing beautifying, altering the appearance. The new dimension to cosmetology research work is given by traditional use of plants. The function of sunscreen is to aid body's defence mechanism against the harmful radiations of the sun mainly UV-B radiations. The efficiency of this sunscreen is mainly based on the ability to absorb, reflect and scatter these radiations. The unit of measurement is in terms of SPF (sun protecting factor).

The sun protection factor (SPF), which is defined as the UV energy required for producing a minimal erythemal dose (MED) in protected skin, divided by the UV energy required to produce an MED in unprotected skin the higher the value of SPF the higher is the protection ability of sunscreen.

The advantages of these natural sources are they are cost effective, stable, purity and easily found in variety of plants. These advantages of natural herbs and their extract enable researchers to promote findings on herbs with sun protection ability than the synthetic ones. "The herbal cosmetics are formulated using various permissible cosmetic ingredients to form the base in which one or more herbal extracts are used to provide defined cosmetic benefits". There are mainly two types of extracts used in cosmetics "total extracts" and "selective extracts"

- Total Extracts- are used as per conventional method of their use.

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- Selective Extracts- are used after detailed research and investigation into their specific activity. Example- liquorice (in skin irritation treatment), gingko (as antioxidant),bearberry (skin lightening) etc1.

2. Material and Method

2.1. Material

Table 1 Materials

Water phase			
S.NO.	**Ingredients**	**Quantity (100 gm)**	**Quantity (20 gm)**
1.	Aloe vera juice	3 gm	0.600 gm
2.	Green tea extract	2 gm	0.400 gm
3.	Liquorice extract	5 gm	1 gm
4.	Sodium lauryl sulphate	0.15 gm	0.030 gm
5.	Stearic acid	0.25 gm	0.050 gm
6.	Lecithin	1 gm	0.200 gm
7.	Propyl paraben	0.1 gm	0.02 gm
8.	Rose water	q.s.	q.s.
Oil phase			
S.NO.	**Ingredients**	**Quantity (100 gm)**	**Quantity (20 gm)**
1.	Basil oil	2 gm	0.400 gm
2.	Turmeric oil	2 gm	0.400 gm
3.	Pomegranate oil	3 gm	0.600 gm
4.	Lanolin	1.5 gm	0.30 gm
5.	Cetyl alcohol	1.2 gm	0.24 gm
6.	Sodium lauryl sulphate	0.05 gm	0.01 gm
7.	Metyl paraben	0.2 gm	0.04 gm

2.2. Methods

- Procurement of oils
- Drug profile of herbal oils, extracts and juices
- Identification and SPF determination of oils
- UV spectrophotometric analysis
- Pre-formulation studies for oils on the basis of SPF
- Preparation of calibration curves
- Solubility studies of herbal oils, extracts and juices
- Market survey of sunscreens
- Formulation of lotion base
- Formulation development of Sunscreen lotion using with oils, extracts and juices
- Solubility study of oils extracts and juices
- Formulation of the topical sunscreen lotion
- SPF Determination of formulated sunscreen lotion and marketed sunscreen lotion
- Evaluation of developed sunscreen lotion
- pH
- Viscosity
- Spreadability

- Stability study
- Extrudability

3. Result and Discussion

3.1. Evaluation of Sunscreen Lotion

3.1.1. pH of the Lotion

The pH of formulated sunscreen lotion was determined by using digital pH meter. About 1 g of the lotion was weighed and dissolved in 100 ml of distilled water and stored for two hours. The measurement of pH of each formulation was done in triplicate and average values were calculated.

Result- The pH of the formulated sunscreen lotion was found to be 6.62 ± 0.01

3.1.2. Viscosity

Viscosity of the formulated sunscreen lotion was determined by Brookfield Viscometer LVT model using T spindle no. A at 20 rpm at a temperature of 25° C andthe determination were carried out in triplicate and the average of three readings was recorded.

3.1.3. Stability studies

Globule size

1 mL of formulated sunscreen lotion was diluted to 10 mL with glycerin. A few drops of this were transferred onto a glass slide and was focused in a microscope. By using eyepiece micrometer, the diameters of 200 particles were determined randomly.

Phase separation

The formulated sunscreen lotion was kept intact in a closed container at 25 - 30°C not exposed to light. Phase separation was observed carefully every 24 hrs for 7 days. Any change in phase separation was checked.

Moisture absorption studies

About 50 mg of formulated sunscreen lotion was taken on a watch glass. A beaker was taken with full of water and was kept in a desiccator without adsorbents and allowed to get saturated. Watch glass with cream was introduced into thedessicator. It was left for 24 hrs.

3.1.4. Extrudability

It is useful empirical test to measure the force required to extrude the material from bottle. The formulations were filled in standard round neck bottle and sealed. The bottle was weighed and recorded. The bottle was placed between two glass slides and was clamped. A 500 gm weight was placed over the glass slide and cap was opened. The amount of formulated sunscreen lotion extruded were collected and weighed. The percent of cream extruded was calculated and grades were allotted:

90%	Extrudability = + + + + Excellent		
80%	Extrudability =	+ + + Good	
70%	Extrudability =	+ +	Fair
50%	Extrudability =	+	Poor

3.1.5. Spreadability

Two glass slides of standard dimensions (20 cm×5 cm) were selected. The formulation was poured onto one of the slide. The other slide placed on the top of the formulation such a that the formulation sandwiched between the two slides in an area occupied by a distance of 7.5 cm, alongside 100 gm weight was placed uniformly to form a thin layer. The weight was removed and the excess of formulation adhering to the slides was scrapped off. The two slides in a position were

fixed to stand (45° angle) without slightest disturbance and in such a way that only the lower slide held firmly by the opposite fangs of the clamps allowing the upper slide to slip off freelyby the force of weight tied to it. 60 gm of weight was tied to the upper slide carefully. The time taken for the upper slide to travel the distance of 5 cm and separate away from the lower slide under the direction of weight was noted. The experiment repeated for 3 times and the mean taken for three such dimensions was calculated. The results were recorded. The spreadability is calculated by using formula:

$$S = \frac{M \times L}{T}$$

Where,
S= Spreadability,
L= Length of glass slide,
M= Weight tied to the upper slide andT= Time. In present experiment

Table 2 Evaluation parameter

S. No.	Parameters	Observation
1.	Color	Pale white
2.	Visual appearance	Smooth lotion
3.	Odor	Pleasant odor
4.	pH	6.62 ± 0.01
5.	Viscosity (cps)	
6.	Extrudability	Good
7.	Spreadability	Easily spreadable

4. Conclusion

Phospholic acids, flavonoids, and high molecular weight polyphenols, which are naturally present in herbs, are extremely beneficial for preventing the damaging effects of UVB radiation on the epidermis. Previous research has demonstrated that the oil or extracts of numerous plants, which contain phenolic compounds, enzymes, and ascorbic acid, are capable of mitigating oxidative damage. Seasonal fruits, including pomegranate, among others, are endowed with antioxidant properties that protect the epidermis from the damaging effects of a variety of physicochemical factors. As a result, it can be incorporated into lotion formulations in order to impart sunscreen properties. Fruits and plants contain a variety of substances, most notably flavonoids, which are frequently beneficial for skin care and have no negative side effects. Consequently, it is imperative to identify an optimal blend of phytoconstituents that can elicit the most favorable outcomes for the epidermis.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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