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FORMULATION AND EVALUATION OF NO MORE ADDED ARTIFICIAL FRAGRANCES SUNSCREEN CREAM

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ABSTRACT

The present study focuses on the formulation and evaluation of completely free of no more added artificial fragrances. The main objective of the study was to develop a safe, effective, and stable sunscreen formulation capable of protecting the skin from harmful ultraviolet (UV) radiation. A sunscreen formulated with mogra (jasmine) and glycerine**,** completely free of no more added artificial fragrances, provide deep hydration**,** potent antioxidant protection**,** and soothing benefits without imperil the irritation, stinging, or redness associated with synthetic scents or perfumes. In formulation of Sunscreens cosmetics manufacturers often added synthetic fragrances or heavy masking oils to mask up the natural odour of chemical or physical UV filters. The sunscreen cream was prepared by emulsification method using glycerine, beeswax, liquid paraffin, zinc oxide, triethanolamine, preservatives, mogra, and distilled water. The prepared formulation was evaluated for various physicochemical and pharmaceutical parameters including colour, odour, texture, consistency, pH, viscosity, spread ability, SPF value, UV absorbance, skin irritation, wash ability, stability. The formulation showed satisfactory organoleptic properties with good consistency and pleasant appearance. The pH of the formulation was found to be suitable for skin application. The sunscreen cream demonstrated good spread ability, acceptable viscosity, stability, and non-irritant behaviour on the skin.

KEYWORDS: Mogra, Glycerine, Zinc oxide, SPF, UV protection, Antioxidant activity.

1. INTRODUCTION

Artificial Fragrances or Scented sunscreens often use synthetic perfumes that can cause phototoxicity when exposed to UV light. By choosing a fragrance-free formula, you avoid the leading cause of contact dermatitis and stinging eyes, and ensure that heavy masking oils do not clog your pores. Essential oils and synthetic fragrances are primary triggers for redness, inflammation, and allergic reactions, especially in humid conditions. Cosmetics refer to products that are used to enhance or alter the appearance of the face, body, or hair. These products can include items such as makeup, skincare preparations, hair dyes, perfumes, and toiletries. The primary purpose of cosmetics is often aesthetic, allowing individuals to achieve desired looks, enhance features, or cover imperfections. However, cosmetics can also serve practical purposes, such as protecting the skin from environmental damage, moisturizing, or treating specific skin concerns. Herbal cosmetics are beauty and skincare products formulated primarily with ingredients derived from plants, herbs, flowers, fruits, roots, and other botanical sources. [1]

SUNSCREEN- Sunscreen is a topical product designed to protect the skin from harmful ultraviolet (UV) radiation emitted by the sun. It typically contains active ingredients that either absorb, reflect, or scatter UV radiation, thereby reducing its penetration into the skin. The primary purpose of sunscreen is to prevent sunburn, premature aging of the skin, and skin cancer caused by excessive UV exposure. Sunscreens are available in various forms, including lotions, creams, gels, sprays, sticks, and powders, with different formulations catering to different skin types and activities. They often contain a combination of organic and/or inorganic compounds, such as avobenzone, oxybenzone, octocrylene, zinc oxide, or titanium dioxide, which work synergistically to provide broad-spectrum protection against both UVA and UVB rays[2]. Additionally, sunscreens may be labeled with a sun protection factor (SPF), which indicates the level of protection against UVB rays, with higher SPF values corresponding to greater protection. It's essential to apply sunscreen generously and reapply it regularly, especially after swimming, sweating, or prolonged sun exposure, to maintain its effectiveness and ensure adequate protection for the skin.

2. MATERIALS AND METHODS

A. Material

(a) NaCl

Table salt's chemical name is sodium chloride. It is mostly utilised as a thickening, emulsifying, or texturizing agent in skincare products. Sodium chloride is frequently used in

exfoliating scrubs and some washing products to produce a mildly abrasive impact for skin exfoliation. While sodium chloride is usually thought to be safe to use in skincare products, people with sensitive or broken skin should take caution when using products that include it as it may cause discomfort. The Advantages of NaCl are Exfloatation, texture and consistency, cleansing.

(b) Paraffin Liquid

Liquid Paraffin is a prescription medicine used in the treatment of dry skin. This relieves dryness and leaves the skin soft and hydrated.

(c) Borax

Borax helps a number of products act to inhibit microbial growth on and in the skin as well. Also, the Borax present in cosmetics, especially in lotions and creams, softens the water phase of the product, thereby enabling its contrasting oil and water components to bind well together.

(d)Triethanolamine

It is a tertiary amino compound, it has a role as a buffer and a surfactant. It acts as a stabilizer in creams and also acts as a thickening agent.

(e) Zinc oxide

Zinc oxide is a great physical sunscreen because it applies a thin coating to our skin that reflects UVA and UVB radiation without penetrating. Zinc oxide gives you broad spectrum protection from UVA, meaning your skin is getting the best sun protection possible.

(f)Glycerine

Glycerine is commonly used with occlusive, another type of moisturizing agent, to trap the moisture it draws into the skin.

(g) Bees Wax

Beeswax has excellent compatibility with oils, it is a little sticky, which can increase the movement resistance between organic sunscreen agents, thus reducing the precipitation and aggregation and making them evenly distributed.

B. Method

It is an oil-in-water type emulsion product.

STEP I

(a) Preparation of Oil Phase

- Add 3gm of bees wax in 4ml of paraffin liquid and heat them on water bath at 62°C to 65°C.

- After melting of beeswax add 2gm of zinc oxide and 0.5gm of methyl paraben in it.
- Stir them properly.

STEP II

(b)Preparation of Water Phase

- Take 2% solution of NaCl, add 3ml of glycerine, 2 ml of triethanolamine, and 2gm of borax.
- Heat all of them and stir properly.

STEP III

Now slowly add the oil phase in water phase at a temperature between 65°C to 80°C with a continuous stirring.

Diagram Oil-in-Water type Emulsion

Table 1 Below is the table for standard formula for the preparation of sunscreen.

Sr. no	Chemicals	Quantity taken
1	Beewax	3gm
2	Paraffin liquid	4ml
3	Zinc oxide	2gm
4	Methyl paraben	0.5gm
5	Sodium chloride	2gm
6	Borax	2gm
7	Glycerine	2ml
8	Mogra	q.s
9	Triethalonamine	2ml

Table 2 Following are the formula for the test preparation.

Sr. no	Chemicals	Formula 1	Formula 2	Formula 3
1	Beewax	3gm	4gm	5gm
2	Paraffin liquid	4ml	5ml	6ml
3	Zinc oxide	2gm	3gm	4gm
4	Methyl Paraben	0.5gm	0.5gm	0.5gm
5	Sodium chloride	2%NaCl sol. q.s	2% NaCl sol. q.s	2% NaCl sol. q.s
6	Borax	1gm	1gm	1gm
7	Glycerine	2ml	2ml	2ml
8	Mogra	q.s	q.s	q.s
9	Triethalonamine	2ml	2ml	2ml

3. EVALUATION OF SUNSCREEN CREAM

Physical Parameters

The preparation should be evaluated for appearance, colour, and homogeneity.

Homogeneity

The prepared formulations were evaluated for homogeneity by means of simple visual appearance and also by touching the formulations[3].

Appearance

The formulations were subjected to test for appearance by observing its color, grittiness, pearlscence and roughness[4].

pH of the Cream

Initially the pH meter was calibrated utilizing standard buffer capsule solution. Then weighed quantity of 0.5g of cream was dissolved in 50.0 ml of suitable solvent, followed by determination of pH using pH meter[5]. The electrodes were dipped into cream solution which helps in determining pH of the sunscreen cream.

Spread ability

The procedure involves selection of two glass slides with dimensions of 20 × 5 cm. The formulation will be placed on one of the slides and the other slide will be placed on top of sunscreen cream so that the cream is sandwiched between the slides with area occupied by 6.5 cm, a weight of 100 g was placed on slides to produce a uniform layer of formulation. The excess cream on slides was wiped off after removing the weight from the slide. The two slides were fixed to stand such that lower slide is held in position by fangs of clamp which allows the movement of upper slide depending on the force due to the weight attached to it[6].

A weight of 60 g was tied to the upper slide and time required for this upper slide to move through a distance of 5cm and get separated from lower slide was determined. The procedure was repeated and mean of 3 repetitions were noted down. The Spread ability is calculated by using

Formula: S = M*L/T

Where, S= Spreadability, L= Length of the glass slide, M= Weight tied to upper slide and T= Time.

Viscosity

The Brookfield viscometer was used to test viscosity, with the proper number of spindle selected (No. 4). A 50 ml beaker was used to hold 50 g of preparation until the spindle groove was dipped and the rpm was set at 100 rotations per minute. Herbal sunscreen viscosity was measured at 100 rpm[7]. The viscosity was determined using the factor attained from the reading Viscosity = Dial Reading × Factor.

Dilution test

The procedure includes mixing of water to the sample. If the emulsion is o/w the preparation doesn't exhibit phase separation and breaking. If the emulsion is w/o the emulsion immediately exhibits phase separation and breaking[8].

After feel

The prepared cream was applied on surface of skin and its emolliency, the residue left over after application of cream and its slipperiness was determined. Removal The ease of removal of the cream applied was examined by washing the applied part with tap water.

In - Vitro Sun Protection Factor (SPF) determination The sunscreen formulation's efficacy can be identified by calculating sun protection factor which is commonly abbreviated as SPF. It is given by the following equation

SPF = Minimal erythema dose in sunscreen protected skin / Minimal erythema dose in non-sunscreen protected skin The minimal Erythemal dose (MED) is generally defined as lowermost time interval or dosage of an UV light.

Rancidity

Weighed quantity of cream was taken and 10 ml of concentrated Hydrochloric acid along with 10 ml of Phloroglucinol and mixed for one-two minutes. All the formulations have passed the test and no pink colour was observed. Irritancy test The cream was applied to the

specified area and time was observed for irritancy, erythema, and edema. The formulations did not exhibit any erythema or edema after application. [9]

4. RESULTS AND DISCUSSION

4.1Evaluation of Sunscreen

As in any other preparation identification quantitative determination of various ingredients are essential for evaluation and quality control point of view. Apart from these routine tests some special tests are necessary for this type of product.

• **Appearance** - Thick and give white shade on the skin or leave the so-called white cast was evaluated.

Figure 1.

• **Oduor** - The smell can be checked by smelling the sample physically.

• **Spreadability** - Spread ability values showed that the creams possessed good and uniform spread ability property.

Figure 2.

• **pH** - Sunscreens not only shield skin from UV rays but also delay the appearance of fine lines, wrinkles, and other indications of aging. The pH assessment was done with the help of pH meter.

Figure 3.

• **Viscosity** - Viscosity of prepared sunscreen cream was evaluated using a viscometer for 5 minutes approximately at 10 rpm.

Figure 4.

• **Vitro SPF assay:** The in vitro screening method is performed by making 10% solution of h cream with 95% ethanol. The absorbance was tested at 290-320nm for each sample at a definite interval of 5 nm, using UV-Visible spectrophotometer.

The following formula was used to get the measured absorbance values at 5-nm intervals (290-320 nm):

$\boldsymbol{SPF}$spectrophotometer= $\boldsymbol{CF} \times \sum \boldsymbol{EE}(\mathbf{320\text{-}290}\boldsymbol{\lambda}) \times \mathbf{1}\,(\boldsymbol{\lambda}) \times (\boldsymbol{\lambda}) \times \boldsymbol{Abs}(\boldsymbol{\lambda})$.

Where EE (λ) is the erythrogenic effect of light at wavelength λ, Abs (λ) is the spectrophotometric absorbance values at wavelength λ, and CF is the correction factor.

The constant values may be found in EE (λ) x I (λ).

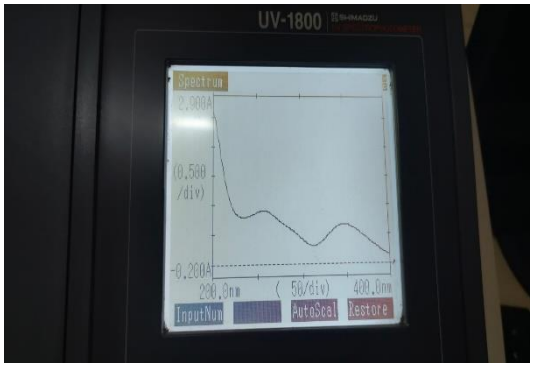

Figure 5.

- **Patch test for irritancy** - Applied a small amount of the product to a small tender area of skin.

Table 3 Below is evaluation parameter of test formulation.

Evaluation parameter	Test preparation F-1	Test preparation F- 2	Test preparation F-3
Appearance	Smooth	Smooth	Smooth
Odour	Floral like	Floral like	Floral like
Spreadibility	Uniform	uniform	uniform
pH	6.10	6.17	6.25
Viscosity	100.3 cp	122.3 cp	188.4 cp
Patch test for irritancy	Nil	Nil	Nil
Spf	10	12	15
Rancidity	No pink colour	No pink colour	No pink colour
Washability	Good	Good	Good
After feel	No residue	No residue	No residue

Evaluation of the sunscreen spray involves various tests including SPF determination, pH, organoleptic properties, viscosity, irritancy, Spread ability and homogeneity to ensure product quality and consistency.

The results of evaluation and stability studies were satisfactory; however, only formulation (F3) met all the requisites for an ideal sunscreen cream, which was found to be the most stable and acceptable. Among three formulaton, the F3 formulation was found to be best because of the better evaluation criteria.

5. CONCLUSION

This research study deals with the exploration carried out with objective of developing sunscreen cream using no more added artificial fragrances. The present study intends to formulate sunscreen cream such that the side effects produced by synthetic artificial fragrances agents could be minimized. This research concludes that a successful formulation has been prepared using mogra fragrance. These natural agents are safe when compared to synthetic agents. Natural substances also produce required UV protection, softness, glow, smoothness, suppleness, nourishing effect and moisturizing effect to the skin along with anti-inflammatory and antioxidant potential. None of the formulations produced skin irritation. Homogeneity and texture was smooth for all the five formulations from F1 to F3. Based on the evaluation parameters observed between F1 to F3, the formulation F3 was found to be good with respect to all the evaluation parameters like Spreadability, pH, Homogeneity with SPF of 15.

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