

## Formulation and Evaluation of Herbal Sunscreen Cream

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**Abstract** -Herbal cosmetics referred as productise formulated using various permissible cosmetic ingredients to form the base in which one or more herbal ingredients are used to provide defined cosmetic benefit only, shall be called as Herbal "Cosmetics". They offer a way to put the body in proper tune with nature. The demand of herbal medicines is increasing rapidly due to their skin friendliness and lack of side effects. The best thing of the herbal cosmetics is that it is purely made by the herbs and shrubs and thus is side-effect free. The natural content in herbs does not have any side effect on human body; instead provide the body with nutrients and other useful minerals. Sunscreens are a constantly evolving component of the dermatologist's therapeutic armamentarium. This article attempts to compile some of the important aspects of sunscreens, including their classification, various indices related to photo protection, and some of the debatable issues related to sunscreens in general. The focus is on material which is current, while at the same time being relevant for the postgraduate.

Keywords- Sunscreen, Polyherbal plant, Herbal cosmetics

### INTRODUCTION

Sunlight reaching the surface of the earth contains visible rays (with wavelength between 400nm-740nm), rays with shorter wavelength (280nm-400nm) called ultraviolet, and rays with longer wavelength (750nm-5300nm) called infrared. Ultraviolet rays, particularly with wavelength below 320nm, are responsible for most of the therapeutic as well as noxious effects that we attribute to sunlight. The overall beneficial effect as well as harmful effects of sun rays on the human body depend on the length and frequency of exposure, intensity of the sunlight and sensitivity of the individual concerned. Cosmetic preparation should protect the skin as effectively as possible from the noxious effects of radiation without reducing the beneficial action. The knowledge of this effect has led to suggestion to incorporate

sunscreen in make-up bases, face powders, creams and after shave lotions.

### Indications for the use of sunscreens.

The primary use of sunscreens is to protect the skin from the short-term and long-term effects of ultraviolet radiation. In today's scenario of procedure-centered dermatology, sunscreens have become an indispensable part of every patient's post-procedure skin care routine. The characteristics of an ideal sunscreen are listed in below.

### Characteristics of an ideal sunscreen

In Order to ensure optimal patient compliance, an ideal sunscreen would be:

- A combination of physical and chemical agents
- Broad spectrum
- Cosmetically elegant
- Non-irritant
- Economical
- Hypoallergenic

The common indications for the use of sunscreens in dermatology are in the prevention and management of

1. Sunburn
2. Freckling, discoloration
3. Photoaging
4. Skin cancer
5. Phototoxic/ photo allergic reactions
6. Photosensitivity diseases
  - Polymorphous light eruption (290-365 nm)

- Solar urticarial (290-515 nm)
  - Chronic actinic dermatitis (290 nm-visible)
  - Persistent light reaction (290-400 nm)
  - Lupus erythematosus (290-330 nm)
  - Xeroderma pigmentosum (290-340 nm)
  - Albinism
  - Photo aggravated dermatoses
7. Post-inflammatory hyperpigmentation (post-procedure)<sup>[3]</sup>

- It should be capable of retaining its sunscreen property for several hours.

- It should be stable under conditions of use.

### Advantages of Herbal Cosmetics over Synthetic

1) Herbal medicine have long history of use and better patient tolerance as well as acceptance.

2) Medicinal plants have a renewable source, which is our only hope for sustainable supplies of cheaper medicines for the world growing population.

3) Availability of medicinal plants is not a problem especially in developing countries like India having rich agro-climatic cultural and ethnic biodiversity.

4) The cultivation and processing of medicinal herb and herbal product is environmental friendly.

5) Prolong and apparently uneventful use of herbal may occur testimony of their safety and efficacy.

6) Throughout the world, herbal medicine has provided many of the most potent medicines the vast arsenal of drugs available to medical science, both in crude form as pure chemical upon which modern medicines are structured.<sup>[7]</sup>

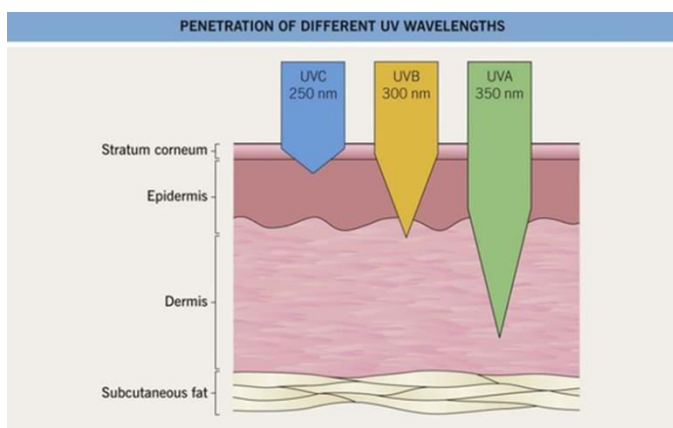
### AIM AND OBJECTIVE

**Aim:** Formulation and evaluation of Herbal sunscreen cream.

#### Objectives:

- The main purpose of the present work is to develop herbal sunscreen cream.
- To study its functionality as herbal sunscreen cream.
- The prepared herbal sunscreen cream will be evaluated for various parameters like pH, acid value, saponification value, irritancy and appearance.
- To formulate effective herbal sunscreen cream to prevent sunburn.
- To reduce side effects of synthetic formulation.

**Spectrum of UV radiation** The biologically active components of ultraviolet (UV) radiation include UVA and UVB radiation. The primary targets of UV radiation in the skin and their corresponding effects are given below:



**Figure: Penetration of different UV Wavelengths**

### SUNSCREEN:

The purpose of suntan preparation is to assist the skin in tanning without painful effects and the purpose of anti-burn preparation is to minimize the harmful effects of sunburn. The material which are used for the above purpose are known as suntanning agents and sunburn preventive agent respectively. Combinedly these are known as sunscreen.

**An ideal sunscreen agent should have the following properties:**

- It should absorb erythrogenic radiations in the range of 290-320 nm without its break down
- It should be resistant to water and perspiration and should also be non-volatile
- It should have suitable solubility characteristic so that requisite amount of it is included in a cosmetic formulation.
- It should be non-toxic, non-irritant, and non-sensitizing.

**MATERIAL AND METHOD**

**List of Ingredients Used in Formulation**

Sr.No	Ingredients	Sources
1	Marigold Flowers	Local market of O'bad
2	Tulsi Leaves	Surrounding of KTPCOP, O'bad
3	Powder of Liquorice Roots	Lab. of KTPCOP, O'bad
4	Stearic acid	Lab. of KTPCOP, O'bad
5	Cetyl alcohol	Lab. of KTPCOP, O'bad
6	Starch	Lab. of KTPCOP, O'bad
7	Sodium Lauryl Sulfate	Lab. of KTPCOP, O'bad
8	Glycerol	Lab. of KTPCOP, O'bad
9	Methyl paraban	Lab. of KTPCOP, O'bad
10	Triethanolamine	Lab. of KTPCOP, O'bad
11	Rose oil	Local market of O'bad
12	Almond oil	Local market of O'bad
13	Water	Lab. of KTPCOP, O'bad

**Table : List of Ingredients Used in Formulation**

**List of Equipments and Instruments Used in Formulation:**

Sr. No.	Apparatus	Name of company
1.	Morter and pestle	Rajesh chemicals, Mumbai.
2.	Sieve	Rajesh chemicals, Mumbai.
3.	Measuring cylinder	Rajesh chemicals, Mumbai.
4.	Beaker	Rajesh chemicals, Mumbai.

5.	Glass rod	Rajesh chemicals, Mumbai.
6.	Thermometer	Rajesh chemicals, Mumbai.
7.	China dish	Rajesh chemicals, Mumbai.
8.	Burette	Rajesh chemicals, Mumbai.
	<b>Instruments</b>	
1.	Weighing balance	BL 220H Shimadzu, Japan.
2.	pH meter	EQUIP - TRONIS EQ 614A
3.	Hot Air Oven	BIO TECHNICS INDIA

**Table : List of Equipments and Instruments Used in Formulation**

**EXPERIMENTAL METHODOLOGY**

**Collection of Plant Material:**

All leaves of Tulsi were collected from local area of Osmanabad and fresh flowers of Calendula, Liquorice were purchased from the local market.

**Extraction:**

The plant material were collected and separated and then dried under shade drying for 4-5 days. The dried plant material were grinder, sieved to get nearly fine amorphous powder. Extraction is the process of obtaining the constituents by separating them from crude drug by the use of solvents. Powered material was extracted with suitable solvent or the mixture of solvents for extracting the various phytoconstituents present in the crude drug.

**Preparation of Marigold Extract:** Petals of the flower were collected and washed thoroughly with distilled water and shade dried for 10 days. Dried leaves were ground into powder form. 50 gm powder was imbibed with 200 ml of 90% Ethanol for maceration upto 4 days with occasional stirring. Ethanolic extract collected and concentrated to get residue. Extract stored in air tight container at cool place.



Figure: Marigold extract

**Preparation of Tulsi Extract-** Leaves of plant were collected and washed thoroughly with distilled water and shade dried for 10 days. Dried leaves were ground into powder form. Then powder followed for extraction same as that for calendula extract. The extract was obtained and stored at cool and dark place in air tight container at cool place.

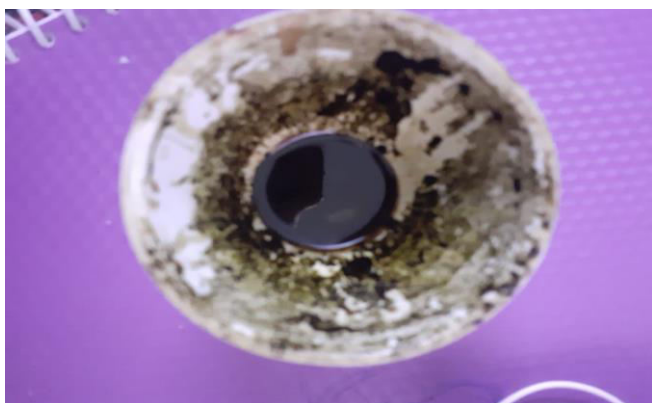


Figure: Tulsi extract

**Preparation of Liquorice Extract:** Liquorice powder was collected and the powder obtained was followed for extraction same as for calendula and Tulsi extract. The extract obtained was stored at cool and in air tight container.



Figure: Liquorice extract

#### Process for preparation of herbal sunscreen:-

- The formulation components used were listed in Table as below: Oil in water emulsion based cream was formulated.
- The emulsifier (Stearic acid) and other oil soluble components (Cetyl alcohol, Almond oil) were dissolved in the oil phase (part A) and heated to 75<sup>o</sup>c.
- The preservative and other water soluble components (methyl paraben, propyl paraben, Triethanolamine, propylene glycol, sodium lauryl sulfate, Starch and all three extracts) were dissolved in the aqueous phase (part B) and heated to 75<sup>o</sup>c.
- After heating, the aqueous phase was added in portion of the oil phase with continuous stirring until cooling of emulsifier took place. And addition of flavour was done.
- Finally transferred in a suitable container.



Figure:- Formulated Herbal Sunscreen Cream

**Formulation Table with Uses:**

Sr. No	Ingredients	Quantity to be taken	Uses
1	Prepared Marigold extract	0.7gm	API
2	Prepared Tulsi extract	0.3gm	API
3	Prepared Liquorice extract	0.4gm	API
4	Stearic acid	1.7gm	Emollient
5	Cetyl alcohol	0.70gm	Emollient
6	Starch	0.3gm	Anticaking agent
7	Sodium Lauryl Sulfate	0.2gm	Surfactant
8	Glycerol	0.6ml	Humectant
9	Methyl paraban	0.004gm	Preservative
10	Triethanolamine	6.048ml	Surface active agent
11	Rose oil	2drops	Flavouring agent
12	Almond oil	3ml	Moisturizer
13	Water	6.048ml	Vehicle
	Total	20gm	

**EVALUATION TESTS:**

**Evaluation of cream PH:**

0.5gm cream was accurately weighed and dispersed in 100 ml purified water.

The PH of the dispersion was measured using PH meter. Also the PH is measured by using PH paper.

**Homogeneity:**

The formulation were tested for the homogeneity by visual Appearance.

**Appearance:**

The appearance of cream was judged by its colour, pearlscence, and roughness and graded.

**Afterfeel:**

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

**Removal:**

The ease of removal of cream applied was examined by washing the applied part with tap water.

**Irritancy test:**

Mark an area (1sq.cm) on the left hand dorsal surface. The cream was applied to the specified area and time was noted. Irritancy, erythema, edema was checked if any for regular intervals up to 24 hrs and reported.<sup>[18]</sup>

**Acid value:**

Take 10 gm of substance dissolved in accurately weighed, in 50 ml mixture of equal volume of alcohol and solvent ether, the flask was connected to reflux condenser and slowly heated, until sample was dissolved completely, to this 1ml of phenolphthalein added and titrated with 0.1N NaOH, until faintly pink color appears after shaking for 30 seconds.

$$\begin{aligned} \text{Acid value} &= 5.61 \times n / w \\ &= 5.61 \times 8 / 1 \\ &= 44.88 \end{aligned}$$

Where,

n = no.of ml 0.1 M KOH required

w = Weight in gm of substance

**Saponification value:**

Introduce about 2 gm of substance refluxed with 25 ml of 0.5 N alcoholic KOH for 30 minutes, to this 1 ml of phenolphthalein added and titrated immediately, with 0.5 N HCL (a ml) carried out blank titration omitting a substance under examination (b ml) calculate saponification value from the expression.<sup>[19]</sup>

$$\text{Saponification value} = 28.05 (b-a) / w$$

$$= 28.05 \times (3.7 - 3.5) / 1 = 5.61 \text{ Where,}$$

w= Weight in gm of substance

**In-Vitro SPF Assay of Cream:**

The in vitro screening method was examined by Kaur et al, 2011 and Ashawat et al 2006, 10% solution of herbal cream was prepared in 95% ethanol. Absorbance was measured for each sample at 290-320 nm at the interval of 5 nm, using UV - Visible spectrophotometer.

The observed absorbance values at 5 nm intervals were calculated by using formula:

$$\text{SPF} = \text{CF} \sum_{290}^{320} \text{EE}(\lambda) \times \text{I}(\lambda) \times \text{Abs}(\lambda)$$

Where, CF is correction factor, EE (λ) is erythrogenic effect of radiation with wavelength λ and Abs (λ) is spectrophotometric absorbance values at wavelength λ. The values of EE (λ) X in (λ) are constants.

The aliquot prepared were scanned between 290-320 nm and the obtained absorbance values were multiplied with the respective EE (λ) and I (λ) values. Then, their summation was taken and multiplied with the correction factor.

**Determination of SPF**

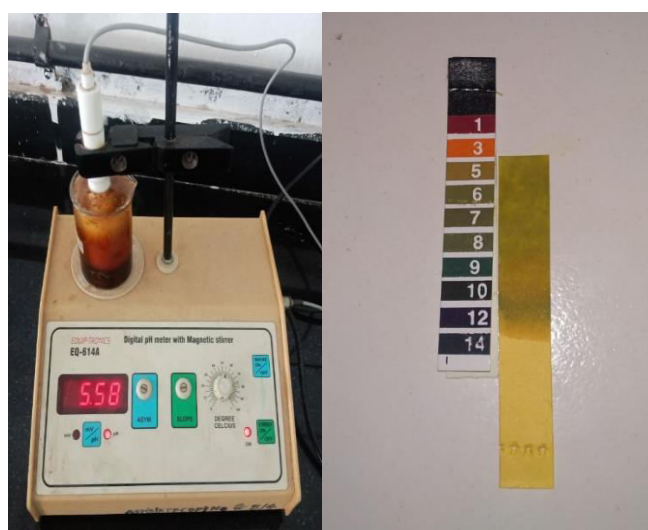
Wavelength (nm)	EE(λ) × I(λ)	Absorbance (A)	EE(λ) × I(λ) × Absorbance (A)
290	0.0150	4.000	0.06
295	0.0817	3.612	0.295
300	0.2874	3.420	0.982
305	0.3278	3.311	1.085
310	0.1865	2.823	0.526
315	0.0837	2.504	0.209
320	0.0180	2.211	0.039
Total			3.196
SPF			31.96

**RESULT AND DISCUSSION:-**

The herbal sunscreen was formulated by adding the required amount of herbal ingredients and other excipients as given in formulation table. These prepared herbal sunscreen was evaluated for various parameters like Appearance, pH determination, Irritancy, Acid value, Saponification value, SPF value.

**Physicochemical Evaluation of Formulated Herbal Sunscreen Cream**

Colour	Yellowish brown
Odour	Characteristic
Consistency	Smooth
PH	5.58
Removal	Easily removed
Irritancy	Non-irrtant
Acid value	44.88
Saponification value	5.61
SPF Value	31.96



**Figure:Ph Test**



Figure:-Acid value



Figure:-Saponification value test with substance



Figure:- Saponification value test with blank

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