



ISSN:2394-2371
CODEN (USA):IJPTIL

RESEARCH PAPER

Formulation and Evaluation of Herbal Sunscreen Cream

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ABSTRACT

Sunscreen creams are gaining more importance in our daily life as moisturizer, UV ray protectant, to prevent sunburn and skin aging. Some of the herbal ingredients or extracts obtained from the plants act as sunscreen resources by absorbing harmful UV rays. By using sunscreens reduce the risk of sun-induced skin cancer caused by high intensity of UV radiation on exposure of skin to sun. The main aim of project is to formulate and evaluate herbal sunscreen cream by using herbal ingredients such as aloe vera gel, coconut oil, carrot seed oil, olive oil, cocoa butter, bees wax, rose oil, vitamin E capsule and propyl paraben as preservative, green tea as antioxidant. Aloe vera gel was selected as humectant and UV ray blocker due to its photostability; it blocks both UVA and UVB rays. The enzyme bradykinase present in aloe vera stops the sunburn and it helps in healing sunburns and sunburn. Carrot seed oil and green tea are helpful in increasing SPF. In the present work herbal sunscreen cream is formulated by 4 different compositions of ingredients and evaluated for various parameters like pH, spreadability, rancidity, loss on drying, acid value, saponification value etc. From the results obtained it is confirmed that F3 is best one; possess SPF for normal skin.

Keywords: - *sunscreen cream, aloe vera gel, sunprotection factor, carrot seed oil, green tea.*

INTRODUCTION

Herbal sun blockers are either a lotion, spray, cream or alternative topical products that help to mask the skin from sun's ultraviolet (UVA and UVB) radiation and even reduce sunburn and skin damage, with the role to lower the chance of carcinoma in presence of herbs and their active constituents [1].

To decrease the intensity of UV radiation reaching the skin by using herbal sunscreens may reduce the risk of sun-induced skin cancer and sunburn. The development of sunscreens containing

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Article Published: Jan. – March 2023

CITE THIS ARTICLE AS

Krishnappa PT, Srinivas AKB, Munegowda S, Anand M. Formulation and Evaluation of Herbal Sunscreen Cream. Int J Pharm Technol Biotechnol. 2023; 10(1):01-06.

phytoconstituents is gaining importance in cosmetic formulations because they help to protect the skin against many harmful exogenous and endogenous agents and also they help to cure many skin conditions [2]. Even they are more advantageous compared to synthetic agents used as sun blockers, due to their potential toxicity in

humans.

It is most important to protect the skin and eyes from the damaging or harmful rays of sun because exposure to ultraviolet rays may contribute photo ageing and leads to skin cancer. Some people are more sensitive to UV rays in such cases they might require special care [3].

It is necessary to develop effective and safe sunscreen formulation to protect the skin from harmful effects of UV radiations and also to heal, prevent suntan, sun burn, photo ageing, hyper pigmentation and at the same time to increase the level of sun protection factor [4].

The herbal cosmetics are gaining rapid consumer demands due to availability of new ingredients, better understanding of skin physiology and because of their antioxidant, emollient, antiseptic, and antibacterial and anti-inflammatory properties [5-7].

Aloe vera is natural herb used in preparation of plenty of cosmetic products. From centuries it is used for medicinal, beauty, skin and health care properties, further used for wound healing [8-10].

MATERIALS AND METHODS

Various phytochemicals and components used in the formulation includes aloe vera gel, green tea, coconut oil, olive oil, rose oil, carrot seed oil, propyl paraben, bees wax, vitamin E capsule, coca butter.

Preparation of cream formulation

Oil in water (O/W) emulsion is formulated. Take the desired quantities of beeswax, coca butter, coconut oil, olive oil and vitamin E capsule, carrot seed oil and rose oil in a porcelain dish; gently melt the ingredients by heating at 70⁰C. Extract green tea by heating with sufficient quantity of water, then filter the contents; to the filtrate add propylparaben, aloevera gel and heat the contents at 65⁰C; stir well until the gel is clear. Prepared aqueous phase was added to the oil phase with continuous stirring until emulsification is complete. Compositions are shown in Table 1.

Table.1 Formula for sunscreen cream

Sl.No	Ingredients	Quantity
1	Aloe vera gel	5g
2	Green tea	1g
3	Bees wax	1g
4	Coconut oil	1ml
5	Cocca butter	0.5ml
6	Olive oil	1ml
7	Carrot seed oil	0.5ml
8	Rose oil	0.3ml
9	Propyl paraben	0.1g
10	Vitmin E capsule	1ml



Figure.1 Sunscreen cream

EVALUATION OF HERBAL SUNSCREEN CREAMS

Evaluating the cream for its sun screening activity

The effectiveness of sunscreens is expressed in terms of sun protection factor (SPF). This is the ratio of UV energy required to produce a minimal erythema dose in protected skin to unprotected skin.

The invitro method is used to calculate the SPF by reading the absorbance of the cream between 290-320nm at every 5nm intervals. Mansur equation is used to calculate SPF. (Mishra et al., 2012)

$$\text{SPF}_{\text{spectrophotometric}} = \text{CF} \times \sum_{290}^{320} \text{EF}(\lambda) \times I(\lambda) \times \text{ABS}(\lambda)$$

Where, CF = correction factor (10),

EE (λ) = erythmogenic effect of radiation with wavelength λ ,

Abs (λ) = spectrophotometric absorbance values at wavelength λ .

The values of EE x I are constants. [11-14]

pH of the Cream:

pH meter was calibrated using standard buffer solution. Then about 0.5g of the cream was weighed and dissolved in 50.0 ml of distilled water and its pH was measured.

Determination of organoleptic properties: The appearance of the cream was judged by its color, consistency, homogeneity, texture, pearl scence and roughness.

Skin irritation test:

Mark an area of 1sq.cm on the left hand dorsal surface. Desired quantity of cream was applied to the specified area and time was noted. At regular intervals of time upto 24hrs it was checked for irritancy, erythema and edema if any and reported. [15]

Loss on drying (LOD)

Take 2g of sample in an empty petriplate, weigh it accurately then keep it in an oven at 105⁰C for 15minutes. After drying reweigh the sample and calculate LOD.

$$\text{LOD} = \frac{\text{initial weight} - \text{final weight}}{\text{initial weight}} \times 100$$

Thermal stability

Take a specific gravity bottle, add sample to it and place it in an incubator for 48 hours if there is no phase separation then cream is thermaly stable.

Acid value:

Take 10 gm of substance dissolved in accurately measured 50 ml mixture of equal volume of alcohol and solvent ether, then the flask was connected to reflux condenser and slowly heated, until complete dissolution of sample. To this mixture add 1 ml of phenolphthalein indicator and titrated against 0.1N NaOH, until faintly pink color appears.

$$\text{Acid value} = n \times 5.61/w$$

n = the number of ml of NaOH required.

w = the weigh of substance.

Saponification value:

Take 2gm of substance refluxed with 25 ml of 0.5 N alcoholic KOH for 30 minutes, to this add 1ml of phenolphthalein and titrated with 0.5 N HCL immediately.

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

The volume in ml of titrant = a

The volume in ml of titrant = b

The weigh of substance in gm = w [16]

Spreadability:

Parallel plate method is used for determining spreadability. It consists of two glass slides in between this excess cream was applied, the upper slide is movable. A weight of 25 grams is placed above the slides for 5 minutes to compress the cream to a uniform thickness and excess cream was scrapped out from edges. Time taken in seconds required to separate two glass slides was measured as spreadability.

Rancidity:

Shake the prepared cream with phloroglucinol and HCL solution if shows no pink colour indicates that cream is free from oxidation.

Table.2: Evaluation parameters

Parameters	F ₃
Colour	Palm green
Odor	Pleasant aroma
Texture	Smooth
Appearance	Cream like
Homogeneity	Uniform and homogenous
Consistency	Good
Skin irritation	No irritation
Spreadability	21.4seconds
Thermal satability	No phase separation
pH	7.2

Rancidity	No pink color
SPF	17.83

Table.3: Absorbance values of formulated sunscreen

Wavelength (nm)	EE(λ) X I(λ) Employed	Absorbance (A)	EE(λ)XI(λ)XAbsorbance (A)
290	0.0150	2.902	0.0435
295	0.0817	2.542	0.2076
300	0.2874	2.043	0.5851
305	0.3278	1.746	0.5709
310	0.1864	1.403	0.2615
315	0.0837	1.148	0.0968
320	0.0180	0.875	0.0157
Total	1		1.783
SPF			17.83

RESULTS AND DISCUSSION

The formulation and evaluation of herbal sunscreen cream was aimed to formulate sunscreen cream with herbal ingredients to minimize side effects compare to synthetic products. The aloe vera gels are having powerful healing activity and even acts as moisturizer. The advantage of plant based products over chemicals in UV protection is that natural products are easily available, economical, non toxic and eco friendly. The main ingredients in this formulation are aloe vera gel acts as a humectant and carrot seed oil as an UV protectant, having SPF of 40-50%. Formulated herbal sunscreens are evaluated for SPF by *in vitro* formulation method to check their effectiveness towards harmful UV rays indicating that method reliable. The attempt is made to develop herbal sunscreen cream by using extracts of aloe vera, carrot seed oil and green tea plays main role in preventing sunburn.

CONCLUSION

It is concluded that the present work may hopefully usefull to prevent and treat the sun burns caused by exposure to UV rays. The formulation F₃ was found to be stable because of its high SPF value, giving the better sunscreen cream. This cream can be used by any skin type and having an advantage that it is non toxic in nature.

ACKNOWLEDGEMENTS

The authors express their thanks to Sri K V College of pharmacy Chickballapur, Karnataka, for providing the necessary facilities to carry out this work and IISC, Bangalore, Karnataka, India, to carryout SPF for sunscreen cream.

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