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DESIGN OF LOTIONS INCORPORATING CROCUS FOR SUNSCREEN

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ABSTRACT

Ultra violet ray absorption is reduced by applying sunscreen reaches the skin and also reduces sun induced diseases such as skin cancer, erythema. The present study is to develop sunscreen as anti UV radiation activity. Phytoconstituents like phenolic acid, polyphenols and flavanoids are used for the protection of the skin from internal and external harming agents and these are mostly used in cosmetic purpose. The ingredients which are extracted from the plants are used on the skin to perform healing of the skin, smoothness, restore the damage. The recent study was involved in preparing the herbal sunscreen lotions with bioactive components like Crocus sativus, aloe vera, and solanum tuberosum extracts are evaluated with diffuse transmitant extract and should monitor SPF. The formulations with herbal extracts (ACA and ACB) showed comparatively high SPF on the formulation devoid of these extracts (ACC) and stood competitive to the standard marketed formulations.

Keywords: Sun screen, Polyherbal, Lotions.

INTRODUCTION

Ultra violet ray absorption is reduced by applying sunscreen reaches the skin and also reduces sun induced diseases such as skin cancer, erythema. The present study is to develop sunscreen as anti UV radiation activity. Based on the wavelength, UV spectra is categorized into 3types. Now a days, the sunscreen consists of decreased chemically concentrated UV filters to produce anti UV radiation activity. Safety, sustainability, low ambient impact are involved in bioactive products. The synthetic photo protective agent in human is rarely used be a is of its toxification but plays as an multi stage process of cancer pathway. Phytoconstituents like phenolic acid, polyphenols and flavanoids are used for the protection of the skin from internal and external harming agents and these are mostly used in cosmetic purpose. The ingredients which are extracted from the plants are used on the skin to perform healing of the skin, smoothness, restore the damage. In the different stages of the cancer, the botanical compounds such as anti mutagenic, anti carcinogenic, non toxic agents shows extreme inhibitory effectiveness on cellular events of the plethora. Aloe vera, basil, cucumber, green tea and almonds, olive oil are used in the preparation of sunscreen lotions. The pure raw materials are used in preparing sunscreen to act against UVB and UVA. Biological properties are involved in polyphenolic compounds. The anti allergic, inflammatory, hepato protective anti thrombolytic, anti oxidant anti tumor, anti bacterial and anti protozoal activities are treated by the usage of the sunscreen lotions. The recent study was involved in preparing the herbal sunscreen lotions with bioactive components like Crocus sativus, aloe vera, and solanum tuberosum extracts are evaluated with diffuse transmitant extract and should monitor SPF [1-3].

MATERIALS

The plant materials used in the formulation were collected from the whole sale supplier of Herbal Crude Drugs, Mumbai, India. Instruments used for analysis were pH meter (Systronic, India), Brookfield viscometer [DV-I, LV-I spindle, Brookfield Engineering Laboratories, USA], Muffle furnace [77 S8HT8,Tempo, India], Micro centrifuge [RM-12CDX, Remi, India], Deep freezer [RQF 650, Remi, India] and UV-V spectrophotometer [UV 1700, Shimadzu, Japan].

FORMULATION

The dried flowers of *crocus sativus* (iridiaceae) and roots of *Solanum tuberosum* (solanaceae) were finely ground and separately passed through sieve no. 80. 500 g of each powder was macerated for 3 days with 95% ethanol and filtered. The filtrates were dried using a vacuum desiccator. 50 g of each extract was weighed and dissolved in 150 ml of ethanol (300 mg/ml). This was concentrated to a final volume of 120 ml. Accurate quantities of Cetyl alcohol, Zinc oxide**,** stearic acid, glycerin, and Hydroxy propyl methyl cellulose (HPMC) (as per table 1) were weighed.

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Accurate quantity of water was measured and taken into a 400-mL beaker. 1.0 g of triethanolamine was added to the water and stirred. The water solution was heated to a temperature of 80ºC to 85ºC. After the water solution has reached the required temperature, melted Cetyl alcohol, Zinc oxide, stearic acid, glycerin, Hydroxy propyl methyl cellulose mixture and Propyl paraben was slowly poured into the water solution a little at a time, stirring constantly. Stirring was continued until a smooth, uniform paste was obtained. The prepared sunscreen lotion was set aside to cool. Then weighed quantity of Aloe gel, Ethanol extract of *Crocus sativus* (EEC), Ethanol extract of *Solanum tuberosum* (EES), Vitamin E (as per table 1) were added and stirred well until all the ingredients mixed uniformly. Finally lemon oil was added as flavoring agent. A total of three formulations, ACA, ACB and ACC were prepared using various formulas (table 1).

EVALUATION

Efficacy of herbal sunscreens was determined by *In-vitro* method using UV-Visible spectrophotometer. 0.10% solution (w/v) each of the three formulated sunscreen lotions in n-propyl alcohol was prepared by dissolving 0.050 g of the sunscreen lotion in 50.0 mL of n-propyl alcohol. 0.10% solution of the two selected commercial sunscreen lotions (SPF 20 and 55) in n-propyl alcohol was also prepared. The aliquots of each formulation prepared were scanned between 290 and 320 nm, with 5 nm interval. SPF was calculated by using the equation derived by Mansaur [4-7]. EE (λ) x I(λ) values determined by Sayre [8-18] was used in below equation (1). Each sample observed in triplicate.

$$\mathbf{SPF} = \mathbf{CF}\ {}_{290}\sum^{320} \boldsymbol{EE(\lambda)\times I(\lambda)\times A(\lambda)}$$

where, CF = correction factor (10), EE (λ) = erythmogenic effect of radiation with wavelength λ, A (λ) = spectro photometric absorbance values at wavelength λ.

Statistical Treatment

Statistical analysis was carried out by using STATS [70] software and results were expressed as mean S.D. All the parameters were statistically analysed at 95% confidence level in the column. Statistical result of psychometric evaluation was further tested by ANOVA [One way analysis].

RESULTS

Colour of the formulated sunscreens (1-3) was found to be cream, yellowish orange and white respectively, type of emulsions existed by tested sunscreens was o/w and pH of the sunscreens. As the speed of rotation increased, viscosity of the tested samples decreased, this behavior of all formulations revealed pseudo plastic behavior of the products. The absorbance values of these formulations are given in table 3. SPF values of all formulations [ACA, ACB, ACC] and the two marketed Sunscreens with known SPF of 55 and 20 were determined using *In vitro* method (Table 4) and the formulation ACB showed high SPF of 19.814±2.7 due to the presence of crocin [19-28].

Table 1. Composition of Various Sunscreen Formulations

S.No	Ingredients	F 1 (%)	F 2 (%)	F 3 (%)
1	Aloe gel	5.0	5.0	-
2	EEC	6.0	-	-
3	EES	-	6.0	-
4	lemon oil	1.0	1.0	-
5	Cetyl alcohol	2.0	2.0	2.0
6	Zinc oxide	12.0	12.0	12.0
7	Stearic acid	4.0	4.0	4.0
8	Glycerin	2.0	2.0	2.0
9	Vitamin E	1.0	1.0	1.0
10	Triethanolamine	1.0	1.0	1.0
11	HPMC	10.0	10.0	10.0
12	Propyl paraben	0.50	0.50	0.50
13	Distilled water	50.50	50.50	67.50

Table 2. Viscosity profile of formulated sunscreens

Sunscreens	Viscosity (cps)					
	10rpm	20rpm	30rpm	50rpm	60rpm	100rpm
ACA	182.3	90.4	59.5	29.8	26.0	17.2
ACB	179.1	91.7	65.3	37.4	33.2	19.6
ACC	181.4	92.5	61.2	34.9	31.3	20.7

Table 3. Absorbance values of the formulated and marketed sunscreens

Wavelength (nm)	ACA	ACB	ACC	Marketed Sunscreen (SPF 55)	Marketed Sunscreen (SPF 20)
290	3.412	3.576	2.005	7.610	3.901
295	3.265	3.455	2.689	7.231	3.780
300	2.829	2.786	2.472	6.917	3.652
305	2.678	2.901	2.507	6.365	2.473
310	1.870	2.574	1.143	5.157	2.915
315	1.014	1.027	0.786	5.823	2.126
320	0.987	0.829	0.594	5.912	1.204

Table 4: SPF of the formulated and marketed Sunscreens

S.No.	Sunscreens	SPF
1	ACA	16.092±2.3
2	ACB	19.814±2.7
3	ACC	14.125±2.1
4	Marketed formulation with SPF 55	54.750±2.0
5	Marketed formulation with SPF 20	19.311±2.4

All of the values are represented as Mean ± SD (n=3), $p < 0.001$.

CONCLUSION

The formulations with herbal extracts (ACA and ACB) showed comparatively high SPF on the formulation devoid of these extracts (ACC) and stood competitive to the standard marketed formulations. The sunscreening property of these extracts may be due to the presence of flavanoids, phenols and terpenoids. It can be concluded that the present research might hopefully bring advancement in the treatment of Sun burns and prevent Skin cancer caused by exposure to UV rays, using herbs as well as in developing poly herbal formulations for safe and effective management of Skin diseases due to harmful UV rays.

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