SUN PROTECTIVE POTENTIAL OF POLYHERBAL SKIN CARE CREAM

ABHINAY KUMAR DWIVEDI[1*], HEMANT KUMAR SHARMA[2]

[1,2]Sri Satya Sai University of Technology and Medical Sciences, Sehore M. P. India
Email: abhinavnbri@gmail.com

ABSTRACT

Objective: Evaluation of sun protective potential of polyherbal skin care cream

Methods: *In vitro* sun protection factor of polyherbal cream of *Centella asiatica, Azadirachta indica, Ocimum sanctum and Hibiscus rosa sinensis* was determined by spectrophotometric method using UV visible spectrophotometer.

Results: The formulation F4 was found most satisfactory in all parameter evaluated with good sun protection potential, so it could be used as effective sun protective agent.

Conclusion: Herbal cosmetics were recognised as a safe, better and effective alternative of synthetic cosmetics that could help to protect and promote skin health naturally without any side effects. The herbal cream F4 was found good sun protection potential against the damaging effects of UV radiations.

Keywords: Herbal cream, UV radiation, Sun protection, SPF, Cosmetics

INTRODUCTION

Natural ingredients played a vital role in the treatment and prevention of suffering of human being from prehistoric time. Herbal cosmetics have been used to promote beautification, appearance and protection to maintain general skin health. UV radiation emitted by the sun could cause a detrimental effect on skin; they might be responsible for the generation of reactive oxygen species or free radical, which is one of the root causes of multiple skin conditions; the UV radiation is also responsible for sunburn, photo ageing, malignances and tanned skin. The natural sun protective agents used in herbal cosmetics filter these harmful radiations and offer protection against damage caused by UV radiation, Herbal cosmetics might be safer than the synthetic one with no or lesser side effects, various compounds especially flavonoids, carotenoids, phenolics are responsible for antioxidant and sunscreen potential of herbal cosmetics. In the present study, we have tried to evaluate the sun protection efficacy of Polyherbal cream containing *Azadirachta indica, Ocimum sanctum, Centella asiatica and Hibiscus rosa sinensis* extracts [1, 2].

MATERIALS AND METHODS

All the chemicals used in the study have been procured from Central Drug House (P) LTD. New Delhi, Analytical grade chemicals and glass wares used in the study have borosilicate and ASGI mark, UV-VIS Spectrophotometer model UV-1700 Pharmaspec Shimadzu, Japan.

Collection and processing of plant material

The leaves of *Centella asiatica, Azadirachta indica, Ocimum sanctum and Hibiscus rosa sinensis* have been collected from the herbal garden Bansal College of Pharmacy, Kokta Bhopal MP. India, in the month of march-april. Plants samples were authenticated by Dr. Suman Mishra, Botany Scientist (MFP-PARC) Van Parisar, Bhopal, MP., India. All collected plant materials were washed with tap water to remove dust debris and dirt, The washed sample were allowed to shade dried for seven days, The dried plant material were grounded using an electric grinder the powdered plant material the sieved to get uniform powdered material, The powdered material have been subjected to extraction with hydroalcoholic solvents.

Extraction of plant material

The hydroalcoholic extracts of plant material have been prepared by soaking the 100 g of each plant sample in 80% ethanol for seven days with occasional stirring; the extract were collected and filtered using whatman filter paper, the filtrate were collected and evaporated under reduced pressure at the temperature 40 °C by using rotary evaporator. The concentrated extracts were placed in the desiccators to remove residual solvent.

Formulation of cream

The cream base have been prepared and evaluated on the basis of preliminary evaluation parameter for the selection of suitable base for cream formulation. The selected base has been used to formulate the polyherbal cream, the herbal cream F1 to F6 has been prepared by incorporating a different proportion of plant extracts. All ingredients were weighed according to the formula, stearic acid, soya lecithin, cetyl alcohol were melted in a beaker and heated up to 75 °C. The plant extracts were dissolved in water then filtered glycerol was added to the filtrate and heated to 75 °C. When the temperature of both oil and water phases reached to similar temperature of 75 °C. The aqueous phase has been added to the oily phase with continuous stirring until the mixture get cooled, and preservative sodium benzoate flavoring agent rose water has been added at last and left at room temperature to obtain the desired product [3-6]. The compositions of the herbal cream are given in table 1.

Evaluation of cream

The herbal cream has been evaluated to determine the quality of the prepared cream; the cream has been tested for homogeneity, appearance, spredibility, after-feel, type of smear, $_pH$, viscosity, type of emulsion and sun protection effect. The physical parameters of herbal creams were studied on room temperature and accelerated temperature [7-12].

Sample preparation and SPF determination

One gram of herbal cream formulation F1 to F6 were separately weighed and transferred in to 100 ml volumetric flask then diluted with ethanol; then the mixture were sonicated for five minutes, the content were filtered using whatman filter paper, first 10 ml filtrate were rejected and 5 ml of aliquot were collected from remaining filtrate and transferred in to 50 ml volumetric flask then again diluted with ethanol up to the mark, 5 ml of aliquot then taken and transferred to 25 ml volumetric flask then again volume has been adjusted with ethanol. The absorption reading were taken in the

range of 290 nm to 320 nm with the intermittent of 5 nm; repeatedly, three reading have been taken for each wavelength. The absorption of each sample has been recorded and SPF values were calculated by applying Mansur equation [13, 14].

Table 1: Ingredients and concentration used in formulations

Ingredients	Formula % w/w					
	F1	F2	F3	F4	F5	F6
Stearic acid	11	11	11	11	11	11
Cetyl alcohol	8	8	8	8	8	8
Glycerol	5	5	5	5	5	5
Soya lecithin	2.5	2.5	2.5	2.5	2.5	2.5
C. asiatica	1.5	2	0.5	1	1.5	2
A. indica	1	0.5	2	1.5	2.5	3
O. sanctum	0.5	1	1.5	2	3	2.5
H. sinensis	2	1.5	1	0.5	2	1.5
Sodium Benzoate	0.20	0.20	0.20	0.20	0.20	0.20
Rose water	7	7	7	7	7	7
Water, qs, 100	qs	qs	qs	qs	qs	qs

Evaluation for sun screen potential

The Efficiency of sunscreen potential has been evaluated through Sun Protection Factor (SPF); the efficacy of a sunscreen is usually expressed by 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

$$SPF = \frac{\text{Minimal erythema dose in sunscreen-protected skin}}{\text{Minimal erythema dose in non sunscreen-protected skin}}$$

The minimal erythemal dose (MED) is defined as the lowest time interval or dosage of UV light irradiation sufficient to produce minimal, perceptible erythema on unprotected skin [16, 17]. The higher the SPF, the more effective the product is in preventing sunburn.

The *in vitro* SPFs were determined according to the method described. The observed absorbance values at 5 nm intervals 290-320 nm were calculated by using the formula [15-17].

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

Where CF Correction factor (10), EE (λ) Erythmogenic effect of radiation with wavelength (λ) Abs (λ) spectrophotometric absorbance values at the wavelength (λ). The values of EE(λ)×I(λ) are constants and showed in table 2.

Table 2: Product function used in the calculation of SPF

S. No.	Wavelength in nm	EE(λ) X I (normalized)
1	290	0.0150
2	295	0.0817
3	300	0.2874
4	305	0.3278
5	310	0.1864
6	315	0.0839
7	320	0.0180
Total		1

RESULTS

Table 3: Parameter evaluated at room temperature

F	Parameter studied at room temperature								
	H	A	S	AF	TS	R	$_pH$	V	TE
F1	**	NCC	**	E	NG	ES	6.1	16092.72±0.03	o/w
F2	***	NCC	***	E	NG	ES	6.3	16023.18±0.06	o/w
F3	***	NCC	***	E	NG	ES	6.2	16037.61±0.02	o/w
F4	***	NCC	***	E	NG	ES	5.9	16041.47±0.05	o/w
F5	***	NCC	***	E	NG	ES	6.2	16101.53±0.04	o/w
F6	**	NCC	**	E	NG	ES	6.4	16113.29±0.03	o/w

***Excellent, **Good, *NCC, No change in colour, Satisfactory, E: Emollient V-Viscosity, TE-Type of emulsion, F-Formulation, NG: Non greasy ES: Easy colour H-Homogeneity, A-Appearance, S-Spredibility, AF-After feel, TS-Type of smear, R-Removal

Table 4: Parameter after accelerated study

F	Parameter after accelerated study								
	H	A	S	AF	TS	R	$_pH$	V	TE
F1	**	NCC	**	E	NG	ES	5.9	16131.32±0.03	o/w
F2	***	NCC	**	E	NG	ES	6.5	16012.08±0.06	o/w
F3	***	NCC	**	E	NG	ES	6.3	16025.31±0.02	o/w
F4	***	NCC	***	E	NG	ES	5.9	16039.07±0.05	o/w
F5	***	NCC	***	E	NG	ES	6.2	16095.53±0.04	o/w
F6	**	NCC	**	E	NG	ES	6.4	16109.29±0.03	o/w

***Excellent, **Good, *NCC, No change in colour, Satisfactory, E: Emollient V-Viscosity, TE-Type of emulsion, F-Formulation, NG: Non-greasy ES: Easy colour H-Homogeneity, A-Appearance, S-Spredibility, AF-After feel, TS-Type of smear, R-Removal

Table 5: *In vitro* SPF value of different formulations

S. No.	Wavelength in nm	EE(λ) X I (normalized)	F1	F2	F3	F4	F5	F6
1	290	0.0150	1.1643±0.029	1.7793±0.009	2.1277±0.011	2.0937±0.011	2.1953±0.008	2.1113±0.005
2	295	0.0817	1.1417±0.009	1.6897±0.005	2.0893±0.021	2.0667±0.004	2.1657±0.008	2.0937±0.012
3	300	0.2874	1.0953±0.010	1.6237±0.010	2.0223±0.008	2.0303±0.005	2.1307±0.004	2.0703±0.005
4	305	0.3278	0.9753±0.007	1.5737±0.025	1.9857±0.009	1.9947±0.013	2.1057±0.007	2.0323±0.007
5	310	0.1864	0.8867±0.005	1.5147±0.008	1.9427±0.005	1.9643±0.009	2.0673±0.005	1.9967±0.004
6	315	0.0837	0.8697±0.005	1.4937±0.014	1.9113±0.009	1.9317±0.009	2.0327±0.005	1.9643±0.007
7	320	0.0180	0.8593±0.009	1.4357±0.009	1.8863±0.007	1.9217±0.004	2.0267±0.005	1.9323±0.013

Table 6: *In vitro* SPF value of different formulations

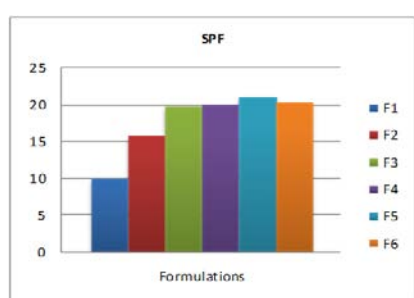| S. No.	Formulation	SPF
1	F1	9.98
2	F2	15.80
3	F3	19.90
4	F4	20
5	F5	21.04
6	F6	20.35

Fig. 1: Graph denoting SPF value of different formulations

DISCUSSION

The preliminary evaluation of Polyherbal cream was found satisfactory, the cream was further evaluated in accelerated condition, there were slight change in pH and viscosity of cream F1, F2, F3, F5, F6 while F4 has shown no change in pH. All formulation showed o/w type of emulsion which helped to easy removal and water washable properties. The formulation F3 and F4 has found most satisfactory in all parameter evaluated. The sun protection potential SPF of all formulation F1 to F6 was determined, the SPF values were found 9.98, 15.80, 19.90, 20, 21.04, and 20.35 for the respective herbal cream. The results of SPF showed that formulation F5 has greater sun protection potential than other formulations.

CONCLUSION

The formulated polyherbal cream F5 has found with greater SPF value compared to all other formulations, while F4 was found most satisfactory in all parameter evaluated with good sun protection potential, so it could be used as an effective sun protective agent. Further stability profile and other potential effects of cream need to be evaluated to enhance the acceptability of Polyherbal cream.

FUNDING

AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

REFERENCES

1. Alakh NS, Jha Sb, SDD. Formulation & evaluation of curcuminoid-based herbal face cream. Indo Glob J Pharm Sci. 2011;1(1):77-84. doi: 10.35652/IGJPS.2011.08.
2. Sahu RK, Roy A, Kushwah P, Sahu A. Formulation and development of face cream containing natural products. Res J Top Cosmet Sci. 2012;3(1):16-9.
3. Rajvanshi A, Sharma S, Khokra SL, Sahu RK, Jangde R. Formulation and evaluation of cyperus rotundus and cucumis sativus based herbal face cream. Pharmacologyonline. 2011;2:1238-44.
4. Singh M, Sharma S, Khokra SL, Sahu RK, Jangde R. Preparation and evaluation of herbal cosmetic cream. Pharmacologyonline. 2011;2:1258-64.
5. Sahu RK, Roy A, Kushwah P, Sahu A. Formulation and development of face cream containing natural products. Res J Top Cosmet Sci. 2012;3(1):16-9.
6. Rajvanshi A, Sharma S, Khokra SL, Sahu RK, Jangde R. Formulation and evaluation of cyperus rotundus and cucumis sativus based herbal face cream. Pharmacologyonline. 2011;2:1238-44.
7. Singh M, Sharma S, Khokra SL, Sahu RK, Jangde R. Preparation and evaluation of herbal cosmetic cream. Pharmacologyonline. 2011;2:1258-64.
8. Chandrasekar R, Sivagami B. Formulation and evaluation of a polyherbal skin care cream containing neem and tulsi. Res J Top Cosmet Sci. Jan-June 2018;9(1):25-32. doi: 10.5958/2321-5844.2018.00006.7.
9. Lachman L, Liberman HA, Kanig JL. The theory and practice of industrial pharmacy. 3rd ed. Mumbai: Varghese Publishing House; 1987. p. 534-63.
10. Sinko PJ. Physical pharmacy and pharmaceutical sciences. 5th ed. Philadelphia: Lippincott Williams and Wilkines Indian Edition: B. I. Publishers; 2006. p. 301-26.
11. Honary S, Chaigani M, Majidian A. The effect of particle properties on the semisolid spreadability of pharmaceutical pastes. Indian J Pharm Sci. 2007;69(3):423-6. doi: 10.4103/0250-474X.34554.
12. Dhase AS, Khadbadi SS, Saboo SS. Formulation and evaluation of vanishing herbal cream of crude drugs. Am J Ethnomed. 2014;1(5):313-8.
13. Bendova H, Akrman J, Krejci A, Kubac L, Jirova D, Kejlova K. *In vitro* approaches to evaluation of sun protection factor. Toxicol *In Vitro*. 2007;21(7):1268-75. doi: 10.1016/j.tiv.2007.08.022, PMID 17945463.
14. Mansur JS, Breder MNR, Mansur MCA, Azulay RD. Determinacao do fator de protecao solar por espectrofotometria. An Bras Dermatol Rio De Janeiro. 1986;61:121-4.
15. Santos EP, Freitas ZM, Souza KR, Garcia S, Vergnanini A. *In vitro* and *In vivo* determinations of sun protection factors of sunscreen lotions with octylmethoxycinnamate. Int J Cosmet Sci. 1999;21(1):1-5. doi: 10.1046/j.1467-2494.1999.181658.x.
16. Ashawat MS, Saraf S, Saraf S. Photoprotective properties of boerhavia diffusa, biosciences. J Biotech Res. 2006;3:257-60.
17. Nandkishore MA, Dubey B. Preparation and assessment of sunscreen cream containing extract acquired from plant origin. J Pharm Sci Emerg Drugs. 2019;7:1. doi: 10.4172/2380-9477.1000132.