



Formulation, Development and Evaluation of Herbal Sunscreen for Skin Protection from Uv Radiation

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KEYWORDS

SUNSCREEN,
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ABSTRACT:

In the current study, successfully formulated and evaluated the herbal sunscreen using toluene extract of Fennel and Turmeric. The phytochemical screening of toluene extracts of fennel and turmeric was done to evaluate the presence of glycosides, tannins, terpenoids, sterols, carbohydrates, saponins and flavonoids. The SPF value of all the formulations was determined using Mansur equation for qualitative analysis of the formulations. The pH of all the formulations was evaluated which shows that the formulation sunscreen complies with the pH of the skin i.e. 5.5. SPF value of all the formulations was determined from F-1 to F-6, that is obtained as 19.59, 20.21, 11.83, 13.50, 32.05, 44.52 respectively. According the product category designation (PCD), the formulation F-5 and F-6 shows high SPF value. So, the F-6 shows SPF 44.52, considered as best herbal formulation for protection against UV radiation in the current study.

INTRODUCTION

The herbs have been used from a very past scenario for the preparation of cosmetic formulations to overcome the problems related to skin and physiological benefits of the body. The herbs have lots of beneficial effect in cosmetic formulations as to reduce wrinkles to prevent skin diseases. The herbs consist of several vitamins and amino acids that are crucial for the development and growth of the human body(1,2). It has vitamin C, Vitamin E, vitamin A in higher composition that is able to reduce the oxidation and free radical reactions as well as overcomes skin problems. (3,4).

The UVA radiation is a type of radiation which is considered as the dangerous type of radiation absorb to the Earth by penetrating the ozone layer it can cause tanning, skin damage sunburns and several other conditions to the body. So, it can also cause damage to the other physiological function of the body. The ozone layer is not capable to block these UVA rays while our body needs some uva raise for synthesis of vitamin D. It's

important to be careful about how much time we spend in the sun to avoid these harmful effects while still getting the benefits of vitamin D production(5).

The sun emits three types of ultraviolet (UV) rays, but only UVA and UVB reach Earth and can harm our skin. UVC rays are blocked by the ozone layer. Both UVA and UVB can cause skin cancer, which comes in two main types: malignant and benign(6,7). Malignant skin cancer, like melanoma, is more dangerous and can spread quickly. It starts as a dark spot on the skin and can be deadly. UVA rays, which go deeper into the skin, are often behind melanoma. Non-melanoma skin cancer is less dangerous but still grows slowly in the outer skin layer. UVB rays mainly affect this outer layer and cause sunburns(8). They're strongest from 10 AM to 2 PM when the sun is brightest. To protect our skin, it's important to limit sun exposure, especially during these peak hours, and use sunscreen that guards against both UVA and UVB rays(9).



1. MATERIAL AND METHOD

Plant

A common wild plant found in various parts of the tropical subcontinent including India is *Curcuma Longa* Linn a member of the *Zingiberaceae* family, commonly referred as 'Turmeric'(10).

Authentication of *Curcuma Longa* Linn

The authentication of leaves of *Curcuma Longa* Linn on the basis of organoleptic and microscopically studies was done from Botanical Survey of India, Central Regional Centre, Prayagraj, Uttar Pradesh.

Authentication of *Foeniculum vulgare* Mill

The authentication of *Foeniculum vulgare* Mill on the basis of organoleptic and microscopically studies was done from Botanical Survey of India, Central Regional Centre, Prayagraj, Uttar Pradesh.

PRELIMINARY PHYTOCHEMICAL ANALYSIS

The various plant parts *Curcuma Longa* Linn and *Foeniculum vulgare* Mill were examined for their organoleptic qualities, which included length, shape, flavour, colour, odour, and taste

The preliminary photochemical test like alkaloid, glycoside, tannins, flavonoids, phenols, saponin, carbohydrates was done using leaves of *cassia auriculata* linn.

FORMULATION

The accurate quantity of stearic acid, glycerol, carbopol 940 P was transferred to sufficient water in 250 ml of beaker. 0.4gm of triethanolamine was added to water and stirred. The water solution was heated up to temperature of 80°C, add required quantity of methyl paraben as preservative. The solution was cool and extract of *Curcuma Longa* Linn and *Foeniculum vulgare* Mill was added followed by addition of rose oil.

Table 1: Formulation of sunscreen

Ingredients	Each 20 gm of sunscreen contains:					
	f-1	F-2	F-3	F-4	F-5	F-6
Turmeric extract powder	2%	4%	-	-	2%	4%
Fennel extract powder	-	-	2%	4%	2%	4%
Carbopol 940p	0.5%	1%	1.5%	2%	2.5%	3%
Stearic acid	0.5%	1%	1.5%	2%	2.5%	3%
Methyl Paraben	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Glycerol	5%	10%	5%	10%	5%	10%
Triethanolamine	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Rose Water	1%	1%	1%	1%	1%	1%
Water	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.

Evaluation of Formulation

The formulations were evaluated for Physical Parameters, Dilution test, Spreadability, Extrudability, pH Determination, Rancidity determination, Viscosity determination, Mansur Equation for Determination of SPF.

2. RESULT AND DISCUSSION

CONFIRMATORY TESTS

The confirmatory tests were performed to identify and phytochemical screening of extract product.



Table 2: Showing confirmatory tests for Turmeric and Fennel.

CONSTITUENTS	Toluene-extracts of turmeric	Toluene-extracts of Fennel
Terpenoid detection: Salkowski test	+	-
Tannin detection: Braemar test	-	-
Flavonoid detection test	+	+
Sterol detection: H2 SO4 test	-	-

Carbohydrate detection test	+	-
Saponin Detection Test	-	+
Glycoside Detection Test	-	+

Physical Parameters

After preparation of all the formulations, they were subjected to evaluation of physical parameters like appearance, colour, and homogeneity.

Table 3: showing physical parameter evaluation of all the formulations

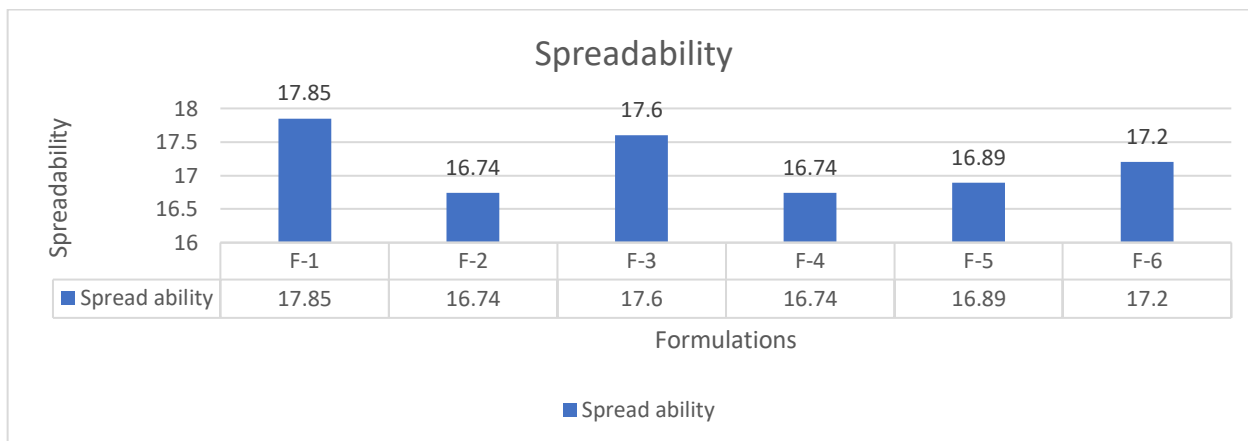
Formulation	Appearance	Colour	Homogeneity
F-1	Cream like appearance	Greenish white	Non-uniform
F-2	Slightly gelly appearance	Yellowish	Non-uniform
F-3	Cream like appearance	Yellowish	Uniform and homogeneous
F-4	Cream like appearance	Pale cream	Uniform and homogeneous
F-5	Cream like appearance	Yellowish	Uniform and homogeneous
F-6	Cream like appearance	Reddish brown	Uniform and homogeneous

Spreadability

The Spreadability study of all the formulations was done and determined from F-1 to F-6 in the range of 16.74 to 17.89. The formulation F-6 shows 94.17 % extrudability/

Table 4: Showing spreadability data of all the formulations.

Formulation	Test -1	Test - 2	Test - 3	Average	M*L (50*7.5)	Spreadability (gm.cm/sec) $S=(M*L)/t$
F-1	19.56	22.45	21.05	21.0	375	17.85
F-2	18.85	23.45	24.85	22.4	375	16.74
F-3	21.25	19.85	22.88	21.3	375	17.60
F-4	19.85	22.78	24.65	22.4	375	16.74
F-5	20.45	22.65	23.45	22.2	375	16.89
F-6	19.77	22.25	23.44	21.8	375	17.20



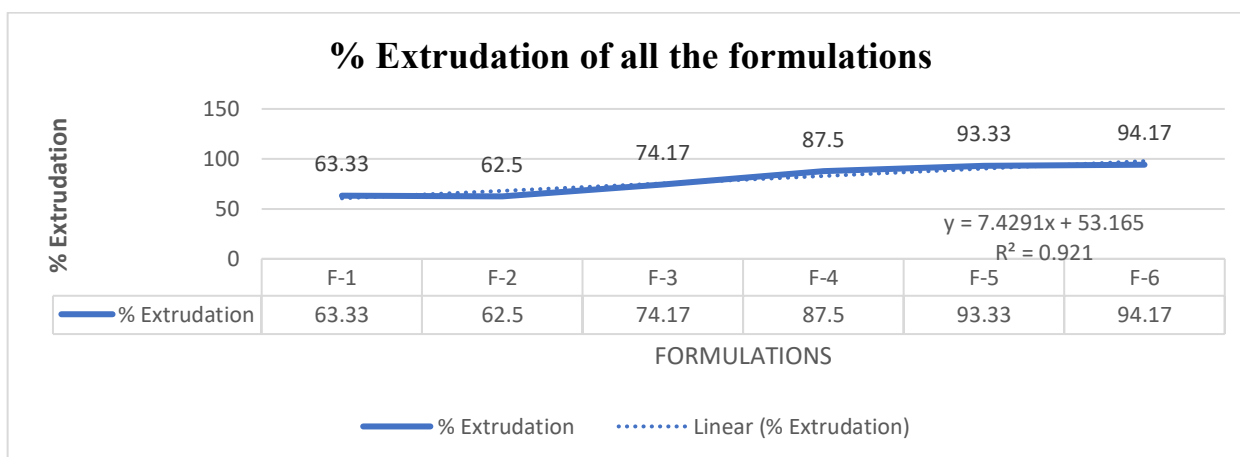
Graph 1: Showing spreadability data of all the formulations.

Extrudability

The extrudability study of all the formulations was done and determined from F-1 to F-6 in the range of 63.33% to 94.17%. The formulation F-6 shows 94.17 % extrudability with “++++” grade.

Table 5: Showing extrudability data of all the formulations.

Formulation	Net weight in tube (gm)	Weight of extruded cream (in gm)	% Extrudation	Grade
F-1	12	7.6	63.33	+
F-2	12	7.5	62.50	+
F-3	12	8.9	74.17	++
F-4	12	10.5	87.50	+++
F-5	12	11.2	93.33	++++
F-6	12	11.3	94.17	++++



Graph 2: Showing extrudability data of all the formulations.

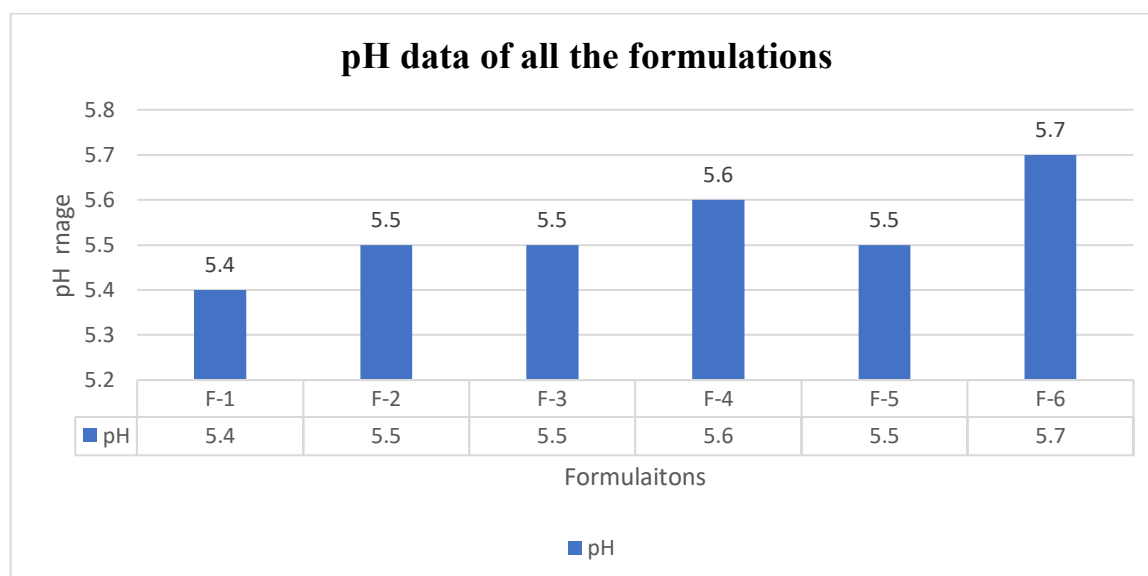


pH Determination

The pH of all the formulation from F-1 to F-6 was determined and was found in the range of 5.4 to 5.7.

Table 6: Showing change in pH with respect to formulations.

Formulation	pH
F-1	5.4
F-2	5.5
F-3	5.5
F-4	5.6
F-5	5.5
F-6	5.7



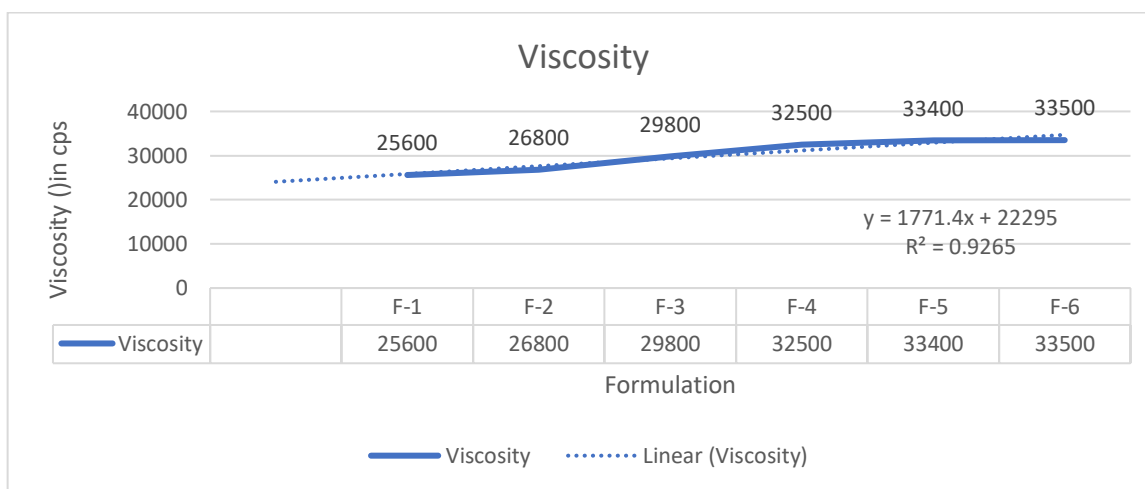
Graph 3: Showing change in pH with respect to formulations.

Viscosity determination

The viscosity of all the formulations was determined by using Brookfield viscometer. The viscosity of F-1, F-2, F-3, F-3, F-5, and F-6 was obtained as 25600, 26800, 29800, 32500, 33400, and 33500 respectively

Table 7.: showing viscosity of all the formulations

Formulation	Viscosity = Dial Reading × Factor		Viscosity
	Dial reading	Factor	
F-1	25.6	1000	25600
F-2	26.8	1000	26800
F-3	29.8	1000	29800
F-4	32.5	1000	32500
F-5	33.4	1000	33400
F-6	33.5	1000	33500



Graph 4.: Graphical presentation of change in viscosity with respect to formulations.

Determination of SPF

The SPF of all the formulations was determined by measuring the lambda max of all the formulation at different wavelengths as 290,295,300,05,310,315, and 320.

The value of SPF for F-1, F-2, F-3, F-3, F-5, and F-6 was obtained as 19.59, 20.21, 11.83, 13.50, 33.05, 44.52 respectively.

Table 8: Showing SPF value of all the formulations.

Formulation	SPF
F-1	19.59
F-2	20.21
F-3	11.83
F-4	13.50
F-5	33.05
F-6	44.52

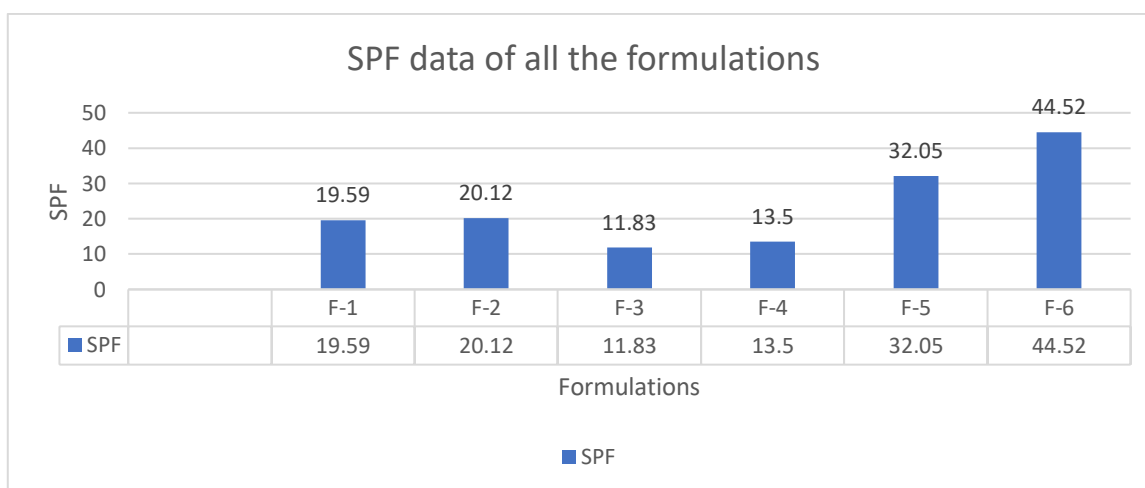


Figure 5. Showing SPF observation for formulation (F-1 to F-6)



3. CONCLUSION

Successfully formulated the herbal sunscreen for protection against radiation using ethanolic extract of turmeric and fennel. Preliminary test of turmeric and fennel was performed to detect the presence of saponin, glycosides, tannins, carbohydrates, terpenes, flavonoids, and sterol. Extrudability of formulation F-5 and F-6 was found to be >90% which shows ++++ as grade of extrudation. The observed data from the preliminary tests confirms the presence of turmeric and fennel respectively. SPF value of all the formulations was determined from F-1 to F-6, that is obtained as 19.59, 20.21, 11.83, 13.50, 32.05, 44.52 respectively. According to the product category designation (PCD), the formulation F-5 and F-6 shows high SPF value. So, the F-6 shows SPF 44.52, considered as best herbal formulation for protection against UV radiation.

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