

Formulation and Evaluation of Moisturising Cream containing *Coriandrum sativum* (Coriander) extract

Research Article

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Abstract

Aim: To formulate and evaluate a moisturising cream containing *Coriandrum sativum* (Coriander) extract. **Method:** The extract used for preparing the cream was obtained by extracting the coriander leaves by maceration followed by Soxhlet extraction method. The extract was evaluated for phytochemical analysis to determine whether chemical constituents were present. The extract was evaluated for anti-bacterial test to check for zones of inhibition using disc diffusion method. Anti-solar activity of the extract was also studied to check for sun protective effect by using UV-Spectrophotometer in the range of 200-400 nm. For the development of cream, the oil and water phases were melted separately into which coriander extract and a suitable preservative was added with continuous stirring. The oil phase was gradually combined into the aqueous phase while continuously stirring to achieve the ideal semi-solid consistency, and an appropriate perfume was used for a pleasing smell. The prepared formulations were evaluated for parameters like organoleptic properties, homogeneity, pH, viscosity, spreadability, type of emulsion, skin irritation test. **Results:** Phytochemical analysis of coriander extract was performed, and it was concluded that terpenoids, sterols, carbohydrates, alkaloids, tannins, and flavonoids were present and saponins was found to be absent. The diameters of the zones obtained for the anti-microbial activity of the extract was found out to be 18 mm and 14 mm for dapsone. The extract showed good antimicrobial activity against dapsone and methanol. The UV absorption spectra showed a strong absorption at 4.00 AU at 205 nm. SPF values were calculated using normalized product function and mean of absorbance, and the obtained SPF value was found out to be 8.2. The prepared formulations were found to be smooth and dark green in colour with a pleasant odour. All the formulations were checked for other parameters like optimum pH, viscosity, spreadability and it was found out that formulation batch F3 showed better results as compared to other batches.

Keywords: *Coriandrum sativum* extract, Moisturising cream, Herbal cosmetic, Phytochemical, Anti-microbial, Sun protective.

Introduction

The largest organ in the human body is the skin. It is the outermost layer of a vertebrate animal's body, which is often soft and flexible. It serves three major purposes: protection, regulation, and sensation. Because it meets with the external environment, skin plays an important immunity role in protecting the body against pathogens and excessive water loss. (21,22)

The appearance and function of the skin are maintained by an important balance between the water content of the stratum corneum and the skin surface lipids. (1,22)

The skin is composed of three layers- epidermis, dermis, and subcutaneous tissue. (21)

The epidermis is the elastic layer on the outside that is continually being regenerated. The dermis is the inner layer that consists of sweat glands, hair follicles, sebaceous glands. The subcutaneous layer is under the dermis and is made up of connective tissue and fat. (21,22)

Herbal cosmetics have been the backbone of Indian medicine and serve various purposes like antibacterial, antiseptic, humectant, anti-inflammatory, antioxidant with less or no side-effects. (2,20). A cream is a semi-solid preparation of oil and water. Many of the oil in water-based creams are cosmetically acceptable because they are less greasy and can be easily washed off with water. Water in oil-based creams mix more easily and have a high concentration of oil. (3,12)

This formulation has been backed with natural ingredients like coriander, beeswax, Vitamin E and with vanilla essence.

The three main components of a moisturizing cream are humectants, emollients and occlusives. Humectants like propylene glycol and glycerine attract water into the epidermis increasing water content in the outer layers. Emollients like liquid paraffin, cetyl

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alcohol, stearic acid function as a lubricant and maintain its soft, smooth, and pliable appearance. Occlusives like beeswax increases the water content of the skin by preventing the evaporation of water from the surface of the skin. (4)

Vitamin E is a naturally occurring antioxidant that protects the skin against free radicals. (Formulation and Clinical Evaluation of Anti-Aging Activity of Blemish Balm Cream Vitamin E and Determination of SPF Value with Spectrophotometry) (5). Vanilla essence is one of the common flavouring agents incorporated in a moisturizing cream which also acts as a preservative. (6)

Coriander (*Coriandrum sativum*) is an immensely popular medicinal plant which belongs to the family *Apiaceae*. It is also known as Cilantro, Cilantrillo, Arab parsley. It is extensively recognized in every recipe used as an herb as well as a spice (13,14,19). Coriander leaves are rich in moisture as they constitute 87.9% moisture, 3.3% protein, 6.5% carbohydrate, and 1.7% total ash. *Coriandrum sativum* is used in promoting digestion and gut health, protects the skin, used as an antioxidant, helps lower blood sugar, treating symptoms of ulcerative colitis. (16,17,18,19)

The natural pigment was obtained by Soxhlet extraction of coriander leaves to obtain the coriander extract using hydro-alcoholic solvent. Further, the extract was studied for phytochemical constituents and anti-solar activity. (3)

Non-nutritive plant compounds known as phytochemicals have anti-inflammatory or disease-preventive qualities. They are non-essential nutrients, which means that the body cannot function without them. The phytochemicals present in *Coriandrum sativum* are cardiac glycosides, flavonoids, alkaloids, terpenoids, tannins, sterols. (13,14)

Anti-solar activity of methanolic extract of coriander leaves was done with the objective of evaluating the photo protective activity using UV-Spectrophotometer in the range of 200-400 nm. (7)

The formulated coriander moisturizing cream was evaluated for different parameters to mark its quality, safety, and efficacy. Appearance which is guarded by texture and colour was evaluated by checking for any surface anomalies and colour distribution throughout the cream, whether the pH is safe to be used topically.(10) They should be stable at room temperature with good consistency and prevent any skin irritation. Lastly, anti-bacterial activity was studied using disc diffusion method to determine the efficacy of the cream to prevent the growth of bacteria.

The present study aims in formulating and evaluating an herbal moisturising cream which will coat the skin with a smooth and emollient layer that will protect and moisturise the skin for treating common issues of the skin and highlight the medicinal importance of *Coriandrum sativum*.

Materials and Methods

Plant material and chemicals

Fresh coriander leaves were collected from the market and all the other chemicals and reagents were obtained from KLE College of Pharmacy, Belagavi.

Processing of plant material

Freshly obtained plant material was thoroughly washed with tap water and then allowed to dry at room temperature. The dried plant material was ground into powder and safely stored until later usage.

Extraction of plant material

The coriander leaves were subjected to maceration followed by Soxhlet extraction method using hydro-ethanolic solvent. The resulting filtrate was combined with the macerated filtrate and filtered once more to obtain the coriander extract. The total weight of the extract was determined to be 21 gm. This extract was used to develop a coriander moisturising cream. (3,12)

Method of formulation of Moisturising cream

Initially the oil phase- Liquid paraffin, beeswax and stearic acid were weighed accurately and melted in a China dish at 70 °C. Cetyl alcohol was melted in another China dish at the same temperature and to that propylene glycol, glycerine, triethanolamine, tween 80 and Vitamin E was added. Methyl paraben and coriander extract of suitable concentration was added in the aqueous phase with continuous stirring to dissolve the ingredients. The melted oil phase was added into the aqueous phase with constant stirring maintaining the temperature at 35-40 °C resulting in a semi-solid consistency. Vanillin perfume was added to the formulation and evaluation parameters of the moisturizing cream were carried out. (1,2,20)

Table 1: Formulation of Moisturising cream

Sr.no.	Ingredients	F1(gm)	F2(gm)	F3(gm)	F4(gm)
1	Coriander Extract	2	3	4	5
2	Vitamin E	1	2	3	4
3	Liquid paraffin	14	11	8.5	7.5
4	Beeswax	0.8	0.8	0.8	0.8
5	Stearic acid	10	12	14.5	15.5
6	Cetyl alcohol	—	0.5	1.5	2
7	Propylene glycol	2.5	2.5	3	3
8	Glycerine	4	4	4	4
9	Triethanolamine	1	1	1	1
10	Tween 80	5	5	5	5
11	Methyl paraben	0.1	0.1	0.1	0.1
12	Vanilla essence	0.1 ml	0.1 ml	0.1 ml	0.1 ml
13	Water	9.5 ml	8.0 ml	4.5 ml	2.0 ml

Evaluation parameters

1. Phytochemical analysis

The coriander extract was subjected to qualitative phytochemical analysis- test for saponins, terpenoids, sterols, carbohydrates, alkaloids, tannins, and flavonoids. (3,13,14,16)

2. Anti-microbial activity of Coriander extract

In order to examine the potential of using the extract to formulate a moisturising cream, the coriander extract's anti-microbial activity was identified.

Disc-diffusion method was used to determine the antimicrobial activity. The sterile filter-paper discs were impregnated with the test material (100 microlitre of coriander extract) and aseptically placed on the inoculated plates (*Propionibacterium acnes* culture). The plates were left at a suitable temperature for 20 minutes to allow pre-diffusion prior to incubation at 37 °C for 24 hours. The sulfone antibiotic, Dapsone was used as a positive control and methanol solvent as a test control for obtaining the results. The plates were observed after 24 hours incubation period for the appearance of zones around the discs. The antibacterial study was evaluated by measuring the diameter of the zones of bacterial growth. (11,19)

Based on this, the concentration of the extract was chosen, and the cream was formulated.

3. Anti-solar activity of coriander extract

The present study aimed at phytochemical examination and anti-solar activity of *Coriandrum sativum*. The methanolic extract has flavonoid content and based on this chemical substance, photo-protective activity was evaluated using by using UV- Visible spectrophotometer in the range of 200-400 nm.

UV radiation which has a short wavelength than visible light is responsible for many of the harmful effects like sunburns, photoaging, photosensitivity. To avoid these problems, many products are available in the market known as sunscreens. Sunscreens are chemical formulations which absorb sun's UV radiation on the skin and prevents it from reaching the skin layer. Many natural substances like anthraquinones, flavonoids, polyphenols have been considered as sunscreen agents because of their antioxidant and UV-radiation absorption properties.

Distinct parts of *Coriandrum sativum* are known for its medicinal properties. The active constituents of coriander are volatile oils, sugars, alkaloids, flavonoids, resins, tannins.

Extraction

The dried coriander leaves were extracted with methanol using Soxhlet apparatus and further evaporated to get a semi-solid coriander extract.

Sample preparation

The Anti-solar activity of coriander extract was determined by Shimadzu UV-1700 Double beam UV spectrophotometer having a 1 cm quartz cell. Sample of 10 mg was transferred into 10 ml volumetric flask and then the volume was made up to the mark using methanol solvent known as stock solution. It was sonicated for 10 minutes at 70-80 °C for uniform distribution of the sample. 1 ml from this stock solution was taken and dissolved in 10 ml methanol to find the absorption spectrum. Then 0.2 ml of the above solution was diluted with 10 ml methanol to achieve the final solution of desired concentration. UV absorption spectra of the extract were recorded in a range between 290-320 nm. Three readings were recorded, and the mean was calculated. Normalized product function

$[EE_{(\lambda)} \cdot I_{(\lambda)} (\text{constant})]$ and mean of absorbance was used to calculate SPF values. (7)

$$SPF = CF \times \sum_{320}^{290} EE_{(\lambda)} \cdot I_{(\lambda)} \cdot abs_{(\lambda)}$$

where,

CF - Correction factor =10

EE – Erythral effect spectrum

I – Solar intensity spectrum

Abs – Absorbance of prepared extracts (Aqueous)

Table 2: Standard values of $EE_{(\lambda)} \cdot I_{(\lambda)}$ used to calculate Sun Protection Factor (SPF)

Wavelength (nm)	$EE_{(\lambda)} \cdot I_{(\lambda)}$ (Constant)
290	0.0150
295	0.0817
300	0.2874
305	0.3278
310	0.1864
315	0.0837
320	0.0180
TOTAL	1

Evaluation of Moisturising Cream

1. Organoleptic Evaluation

- Appearance and colour- It was evaluated physically, according to its state and colour.
- Texture- The cream was evaluated for non-grittiness and smooth application.
- Odour- The odours of all the formulations were evaluated for a characteristic odour.

2. Homogeneity: All the formulations were evaluated for uniform distribution of the extract in the moisturising cream. (10)

3. pH: All the formulations were checked for their pH by using pH meter in the suitable range of 6.7-7.3. (1,9,10)

4. Spreadability: The ability of the moisturising cream to spread was evaluated by applying some amount of cream on a petri dish and adding 0.5 gm weight over it for 1-2 minutes to test its spreading ability. (1)

5. Viscosity: The viscosity of cream indicates that the cream is easily spreadable by lesser amounts of shear. (1,9,10)

6. Type of emulsion (Dye Test): A small amount of cream is placed on a glass slide and mixed with a dye-methylene blue. Place a cover slip and observe under the microscope for the colour of the dispersed phase and the continuous phase. (2,8,9,15)

7. Skin irritation test: The formulated moisturising creams were applied on a part of the skin and checked for any irritation or reaction. (10)

8. After feel: Emollience, slipperiness and amount of residue left after application of the moisturising cream was checked.

9. Removal: The ease of removal of the cream after washing with tap water was checked.

Results and Discussion

Phytochemical analysis of coriander extract was performed, and it was concluded that terpenoids, sterols, carbohydrates, alkaloids, tannins, and flavonoids were present and saponins was found to be absent.

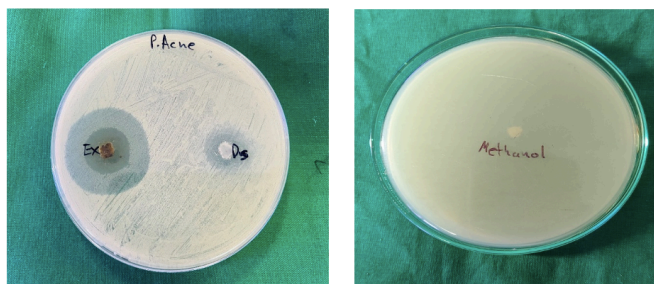
Table 3: Phytochemical analysis

Test	Present/absent
Test for Saponins	-
Test for Terpenoids	+
Test for Sterols	+
Test for Carbohydrates	+
Test for Alkaloids	+
Test for Tannins	+
Test for Flavonoids	+

‘+’ indicates positive results and ‘-’ indicates negative results

The Anti-microbial activity was performed to evaluate the zones of inhibition of the extract compared to a positive test. The diameters of the zones obtained for the extract was found out to be 18 mm and 14 mm for dapsone. Methanol solvent, taken as a control showed no growth of zone. Hence the extract showed good antimicrobial activity against dapsone and methanol.

Fig.1. a) Zone of Inhibition for extract and dapsone b) Zone of Inhibition for methanol solvent



Anti-solar activity- The result obtained showed the ability of the extract to absorb UV radiation and hence proved its UV protection ability. The UV absorption spectra showed a strong absorption at 4.00 AU at 205 nm. The graph also showed a moderate absorption at 200-400 nm. SPF values were calculated using normalized product function and mean of absorbance, and the obtained SPF value was found out to be 8.2.

Figure 2: Computerized display reading of absorption spectra of the methanolic extract taken from the spectrophotometer

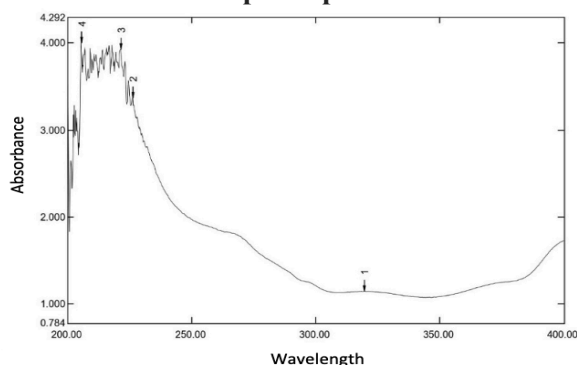


Figure 3: UV absorption of coriander extract

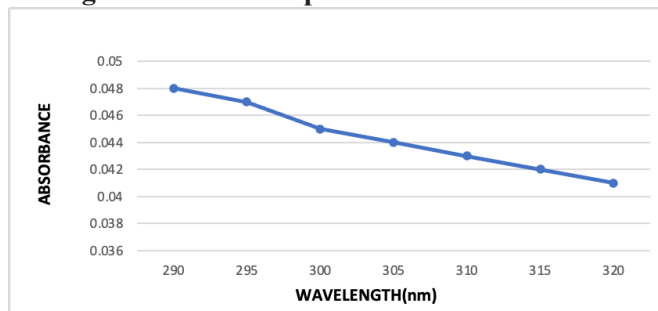


Table 4: Absorbance v/s Wavelength

Sr. no.	Wavelength	Absorbance
1	319.60	1.146
2	226.20	3.370
3	221.40	3.929
4	205.40	4.000

Table 5: Absorption maxima of aqueous extract of coriander leaves and calculated SPF using mean value

Sr. no.	λ (nm)	Absorbance(n=3) mean of three (aqueous extract)
1	290	0.048±0.052
2	295	0.047±0.053
3	300	0.045±0.055
4	305	0.044±0.056
5	310	0.043±0.057
6	315	0.042±0.058
7	320	0.040±0.059
	SPF	8.2

Four different formulations of moisturising cream containing coriander extract were prepared and evaluated for various parameters to check the consistency and quality. All the formulations were confirmed to be O/W emulsions by the dye test.

The prepared formulations were found to be smooth and dark green in colour with a pleasant odour, typically of vanilla. The formulated creams were found to be stable at room temperature except F2 which showed a slight change in colour due to temperature variations that made it unstable. It also had an average distribution of extract into the cream which further contributed to its instability. The appearance, texture and application were checked for its aesthetic look and effortless application. Negative results were found for skin irritation test for all the formulations. All the formulations were checked for other parameters like optimum pH, viscosity, spreadability and it was found out that formulation batch F3 showed better results as compared to other batches.

Figure 4: Formulated moisturising cream

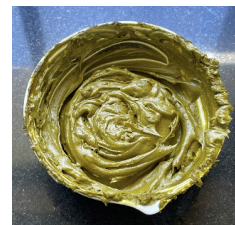


Table 6: Evaluation parameters

Evaluation Parameters	F1	F2	F3	F4
Appearance and colour	Semi-solid and Seaweed green	Semi-solid and olive green	Semi-solid and seaweed green	Semi-solid and seaweed green
Texture	Smooth and non-gritty	Smooth and non-gritty	Smooth and non-gritty	Smooth and non-gritty
Odour	Pleasant odour	Pleasant odour	Pleasant odour	Pleasant odour
Homogeneity	Uniform distribution	Average distribution	Uniform distribution	Uniform distribution
pH	7.39	6.83	6.76	7.20
Spreadability	2.6 cm	2.2 cm	2.7 cm	1.75 cm
Viscosity	4368.6 cP	2425.3 cP	2137.6 cP	2606.3 cP
Type of emulsion	O/W	O/W	O/W	O/W
Skin irritation	Absent	Absent	Absent	Absent
After feel	No residue left	Little residue left	No residue left	No residue left
Removal	Easy removal	No easy removal	Easy removal	Easy removal

Conclusion

Although there are many moisturising creams on the market, there is still a role for herbal creams as they are natural, safe to use, and either have no or very few side effects. The herb *Coriandrum sativum* is used to cure a variety of illnesses, and it can serve as a significant platform for the development of reasonable, efficient, and safe medicines.

Moreover, it is capable of acting as an antibacterial agent against *P. acne*. In this study, four formulations were prepared with different ingredient ratios, and their physicochemical properties were assessed.

The UV light that is thought to cause skin conditions can be absorbed by coriander extract. The coriander extract's proven anti-solar activity demonstrates its significance in anti-solar formulations.

The results of the tests for stability, pH, viscosity, spreadability, and skin irritation indicated that F3 is the optimum formulation and would serve as an excellent moisturising cream.

Abbreviations

°C – Degrees Celsius
 gm – Grams
 mg – Milli grams
 ml – Milli litre
 mm – Milli metre
 nm – Nanometre
 AU- Absorbance Units
 cm – Centimetres
 O/W – Oil in Water
 cP – Centi poise

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