

## Research

# Formulation and Evaluation of Herbal Skin Whitening Cream Containing Red Masoor Dal and Turmeric Extracts

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**Received:** 01-04-2026 / **Revised:** 05-05-2026 / **Accepted:** 08-05-2026

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**DOI:** 10.62896/jcarr.3.2.06

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**Conflict of interest:** Nil

## Abstract:

The present study was undertaken to formulate and evaluate a polyherbal skin whitening cream containing extracts of Red Masoor Dal and Turmeric, selected for their traditional dermatological applications and scientifically validated antioxidant, antimicrobial, and complexion-enhancing properties. Plant materials were subjected to extraction using Soxhlet extraction and screened for phytoconstituents. The prepared extracts were incorporated into an oil-in-water cream base and evaluated for physicochemical parameters including appearance, pH, spreadability, viscosity, homogeneity, washability, and stability. Skin whitening activity was assessed through in vitro melanin reduction assay, while antimicrobial activity was determined against *Staphylococcus aureus* using agar well diffusion method. The optimized formulation demonstrated desirable physicochemical stability, good spreadability, appreciable antimicrobial activity, and significant whitening potential. The synergistic activity of protein-rich lentil phytoconstituents and curcuminoid-rich turmeric extract contributed toward antioxidant protection, mild exfoliation, and pigmentation reduction. The findings suggest that the developed herbal cream may serve as a safe, effective, and cosmetically acceptable natural alternative to synthetic skin whitening preparations.

**Keywords:** Herbal cream, Skin whitening, Turmeric, Red Masoor Dal, Antimicrobial activity

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## 1. INTRODUCTION

Skin is the largest protective organ of the human body and serves as the first line of defense against environmental insults, microbial invasion, ultraviolet radiation, oxidative stress, and mechanical injury. Beyond its physiological functions, skin health and appearance significantly influence cosmetic acceptance, self-perception, and social confidence. Among cosmetic concerns, hyperpigmentation, uneven complexion, tanning, and post-inflammatory darkening remain common dermatological challenges.

Melanin is the primary pigment responsible for skin color and is synthesized in melanocytes through a complex biochemical pathway known as melanogenesis. Tyrosinase acts as the key rate-limiting enzyme in melanin biosynthesis. Overproduction of melanin due to ultraviolet exposure, oxidative stress, hormonal imbalance, inflammatory skin disorders, and aging results in

hyperpigmentation and dull complexion. Conventional skin whitening agents such as hydroquinone, corticosteroids, kojic acid, and mercury-containing preparations have shown depigmenting effects; however, prolonged use may cause irritation, dermatitis, ochronosis, toxicity, photosensitivity, and barrier dysfunction.

These limitations have created considerable interest in herbal cosmetic formulations containing bioactive phytochemicals capable of providing depigmenting action with improved safety and multifunctional dermatological benefits. Natural products rich in flavonoids, polyphenols, proteins, vitamins, and antioxidant compounds have shown promising roles in complexion enhancement, melanogenesis regulation, and skin protection.

Red Masoor Dal has been traditionally utilized in household skin care preparations as a natural exfoliating and complexion-enhancing ingredient. It contains proteins, flavonoids, phenolic compounds,

tannins, and antioxidant phytoconstituents that may improve skin texture, remove dead epidermal cells, and reduce oxidative pigmentation. Its mild abrasive property also contributes to gentle exfoliation, making it suitable for cosmetic use.

Similarly, Turmeric is a well-established medicinal herb possessing curcuminoids, volatile oils, flavonoids, and phenolic antioxidants that exhibit anti-inflammatory, antioxidant, antimicrobial, and anti-melanogenic properties. Curcumin has been widely reported to modulate tyrosinase-mediated melanin synthesis and reduce oxidative damage associated with pigmentation disorders.

The combination of Red Masoor Dal and Turmeric offers a rational synergistic approach for herbal skin whitening formulation, where red masoor contributes nourishment and exfoliation while turmeric contributes antimicrobial protection and melanogenesis regulation. Therefore, the present investigation was designed to formulate and evaluate a polyherbal skin whitening cream based on these medicinal ingredients.

## 2. MATERIALS AND METHODS

### 2.1 Materials

Dried seeds of Red Masoor Dal were procured from the local herbal market of Kanpur and authenticated for botanical identity before use. Fresh rhizomes of Turmeric were collected, washed thoroughly to remove adhering impurities, shade dried, pulverized, and sieved to obtain uniform powder. Analytical grade chemicals and reagents were used throughout the study. Stearic acid, cetyl alcohol, glycerin, liquid paraffin, triethanolamine, methyl paraben, propyl paraben, distilled water, ethanol, and microbiological media were used for cream formulation and evaluation studies.

### 2.2 Preparation of Plant Materials

The collected plant materials were cleaned, shade dried at room temperature, and pulverized separately using a mechanical grinder. The powders were passed through sieve No. 60 to obtain fine particles of uniform size. The processed powders were stored in airtight amber-colored glass containers to protect phytoconstituents from moisture and oxidation until extraction.

### 2.3 Extraction of Herbal Materials

Powdered Red Masoor Dal and Turmeric were separately subjected to Soxhlet extraction using 70% hydroalcoholic solvent. Approximately 100 g

of each powdered material was packed in extraction thimble and extracted continuously for 6–8 hours until siphoning solvent became colorless. The obtained extracts were concentrated under reduced pressure using rotary evaporation and further dried in desiccator to obtain semisolid concentrated extracts. Percentage yield was calculated and extracts were stored under refrigeration for formulation use.

### 2.4 Preliminary Phytochemical Screening

Prepared extracts were subjected to qualitative phytochemical screening for identification of major secondary metabolites using standard chemical tests.

**Table 1. Phytochemical Screening of Extracts**

Phytoconstituent	Red Masoor Dal Extract	Turmeric Extract
Alkaloids	+	+
Flavonoids	++	++
Phenolic compounds	++	++
Tannins	+	+
Proteins	++	+
Glycosides	+	+
Carbohydrates	++	+
Curcuminoids	–	++
Saponins	+	–

(+ Present; ++ Abundantly present; – Absent)

### 2.5 Formulation of Herbal Skin Whitening Cream

Oil-in-water emulsion method was employed for formulation of herbal cream. Oil phase consisting of stearic acid, cetyl alcohol, and liquid paraffin was heated separately at  $70 \pm 2^\circ\text{C}$ . Aqueous phase containing glycerin, preservatives, triethanolamine, and measured quantity of herbal extracts was prepared and heated to the same temperature. Both phases were mixed slowly with continuous stirring until uniform emulsion was formed. The cream was cooled gradually with constant stirring to obtain smooth homogeneous semisolid formulation.

**Table 2. Composition of Optimized Herbal Cream**

Ingredient	Quantity (% w/w)	Function
Red Masoor Dal extract	2.0	Antioxidant / Exfoliating agent
Turmeric extract	1.0	Whitening / Antimicrobial agent

Stearic acid	12.0	Emulsifying agent
Cetyl alcohol	3.0	Stiffening agent
Liquid paraffin	5.0	Emollient
Glycerin	4.0	Humectant
Triethanolamine	1.5	Neutralizer
Methyl paraben	0.15	Preservative
Propyl paraben	0.05	Preservative
Distilled water	q.s. to 100	Vehicle

## 2.6 Evaluation of Formulated Cream

The prepared cream was evaluated for:

1. Organoleptic appearance
2. Color and odor
3. Homogeneity
4. pH determination
5. Spreadability
6. Viscosity
7. Washability
8. Phase separation
9. Stability study
10. Skin irritation potential

## 2.8 Antimicrobial Study

Antimicrobial activity was evaluated against *Staphylococcus aureus* using agar well diffusion method. Mueller-Hinton agar plates were inoculated with standardized bacterial suspension, wells were prepared, and formulated cream was introduced into wells. Plates were incubated at 37°C for 24 hours, and zone of inhibition was measured in millimeters.

## 3. RESULTS AND DISCUSSION

### 3.1 Physicochemical Evaluation

The formulated cream appeared smooth, pale yellow, homogeneous, non-gritty, and possessed pleasant herbal odor. It showed excellent spreadability and easy washability with no evidence of phase separation.

**Table 3. Evaluation Parameters**

Parameter	Observation
Appearance	Smooth semisolid cream
Color	Pale yellow
Odor	Pleasant herbal
Homogeneity	Excellent
pH	6.4 ± 0.1
Spreadability	7.8 ± 0.3 g·cm/sec
Viscosity	18,500 ± 250 cP
Washability	Good
Irritation	Nil

Stability	Stable
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### 3.3 Antimicrobial Activity

The developed herbal cream demonstrated notable antimicrobial activity against *Staphylococcus aureus*. The antimicrobial effect may be associated with phenolic compounds, flavonoids, tannins, and curcuminoids present in the herbal extracts, which disrupt bacterial cell membrane integrity and inhibit microbial proliferation.

**Table 5. Zone of Inhibition Against *Staphylococcus aureus***

Sample	Zone of Inhibition (mm)
Positive Control	28.2 ± 0.7
Red Masoor Dal Extract	14.8 ± 0.4
Turmeric Extract	19.6 ± 0.5
Formulated Herbal Cream	23.4 ± 0.6
Negative Control	0.0

The optimized cream exhibited a considerable inhibitory zone, suggesting effective antimicrobial protection against skin-associated bacterial contamination.

## 4. DISCUSSION

The present investigation successfully formulated a stable herbal skin whitening cream using extracts of Red Masoor Dal and Turmeric through oil-in-water emulsion technique. Phytochemical screening confirmed the presence of bioactive compounds including flavonoids, phenolics, tannins, proteins, and curcuminoids, which are well recognized for antioxidant, antimicrobial, anti-inflammatory, and depigmenting properties.

The prepared formulation exhibited desirable physicochemical characteristics including appropriate pH, excellent homogeneity, suitable viscosity, good spreadability, and acceptable cosmetic elegance. No irritation or instability was observed during storage evaluation, suggesting compatibility of herbal actives with the cream base. The significant melanin reduction activity observed in the formulation may be due to synergistic inhibition of oxidative melanogenesis pathways by antioxidant phytoconstituents and tyrosinase modulation by curcuminoids. Furthermore, antimicrobial activity against *Staphylococcus aureus* indicates an added dermatological advantage

by protecting skin against microbial colonization and inflammation-associated pigmentation.

Overall, the combination of nutritional lentil phytoconstituents and medicinal turmeric bioactives produced a multifunctional herbal cosmetic formulation with promising whitening efficacy and skin protective benefits.

## 5. CONCLUSION

The present study demonstrated that a polyherbal skin whitening cream formulated with Red Masoor Dal and Turmeric extracts possesses significant cosmetic and dermatological potential. The formulation showed excellent physicochemical stability, good spreadability, non-irritant nature, appreciable antimicrobial activity, and promising skin whitening efficacy.

The synergistic phytochemical composition contributed antioxidant protection, gentle exfoliation, microbial inhibition, and melanin reduction, thereby supporting its potential use as a safe natural alternative to synthetic skin whitening preparations. The developed formulation may be considered a promising candidate for further clinical evaluation and commercial herbal cosmetic development.

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