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# Formulation and Evaluation of a Novel Herbal Cream Containing Fenugreek and Turmeric Extracts

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## Abstract

*Curcuma longa* (turmeric) and *Trigonella foenum-graecum* (fenugreek) are herbs known for anti-inflammatory and wound-healing effects. To formulate and evaluate a topical polyherbal cream from turmeric and fenugreek extracts and test its anti-inflammatory activity. Hydroalcoholic extracts of both plants were prepared and added to different cream bases. The best formulation (F3) was selected after stability testing. Anti-inflammatory activity was studied in 20 rats using the formalin-induced paw edema model for six days. Betamethasone cream was used as the standard. The optimized cream was stable and non-greasy. It showed strong anti-inflammatory effects, similar to betamethasone. A polyherbal cream with turmeric and fenugreek is safe, stable, and effective for dermal inflammation.

**Keywords:** *Curcuma longa; Trigonella foenum-graecum;* Topical formulations; Cream evaluation; Anti-inflammatory activity

## 1. Introduction

Inflammation is part of the body's immune response and is a serious response to any injury. The four main signs of inflammation are pain, redness, heat, and swelling [1]. For years, medicinal plants have been a valuable source of healing for communities globally. Additionally, it continues to serve as a crucial healthcare and pharmaceutical source for around 85% of the global population, with 80% of synthetic drugs being based on it [2]. One widely utilized plant is turmeric (Curcuma longa L.), a rhizomatous herbaceous plant belonging to the ginger family, Zingiberaceae. It has long been used as an antiseptic and anti-inflammatory agent for wound healing due to its bioactive compounds and antioxidant properties [3]. Additionally, turmeric extract has several characteristics that regulate enzymes, inflammatory cytokines, transcription, growth factors, and protein kinases. This natural substance protects the skin by neutralizing free radicals and decreasing inflammation by inhibiting nuclear factor B. Not only does it accelerate wound healing, but it also enhances collagen production and increases the presence of fibroblasts and vascular density in wounds, creating the highest amount of perplexity [4]. The genus Curcuma, which has about 133 species, has been used for a number of medicinal purposes [5]. C. longa has recently been shown to have a wide range of pharmacological and therapeutic benefits, such as anti-diabetic and cardiovascular benefits, anti-inflammatory and anti-edema actions, antibacterial and anticancer properties, hepatoprotective effects, prevention of Alzheimer's disease, and photo protective activity [6]. The high content of bioactive constituents in fenugreek seeds suggests their potential role as a natural alternative for pharmaceutical agents in managing minor pain and inflammatory conditions [7-8]. Currently, fenugreek is extensively used for treating diabetes mellitus, hyperlipidemia, arthritis, hypothyroidism, hot flashes in menopausal women, dysmenorrhea, increasing breast-milk volume in postpartum mothers, promoting hair growth, and addressing infertility [9]. Research has shown that ethanol extract, mucilage, and flavonoids of fenugreek seeds possess anti-inflammatory, anti-arthritic, and antioxidant properties [10]. The spectrum of anti-inflammatory therapies has

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expanded from conventional NSAIDs to advanced biologics and kinase inhibitors, offering broader and more targeted treatment options [11]. The absence of curative options and prolonged recovery times contributes significantly to the economic and social challenges faced by patients, healthcare providers, and their families [12]. Although there is proof that *Trigonella foenum-graecum* (fenugreek) and Curcuma longa (turmeric) have anti-inflammatory and wound-healing properties, nothing is known about how well they work together in topical formulations. Most previous research investigated oral administration of single-herb extracts, with little attention given to developing stable polyherbal creams for dermal inflammation. Furthermore, there is insufficient evidence comparing the efficacy of each herbal formulation with standard anti-inflammatory drugs in validated animal models. Accordingly, the existing gap pertains to the comprehensive investigation of a stable topical polyherbal formulation combining turmeric and fenugreek, encompassing both stability profiling and in vivo evaluation of anti-inflammatory potential. This article's primary goal is to formulate and assess an anti-inflammatory cream using plant extracts, such as fenugreek and turmeric.

## 2. Materials and methods

### 2.1. Sample collection and macroscopic identification of both plants

In this study, turmeric rhizomes were purchased from the local market in Sana'a, Yemen, while fenugreek seeds were collected from the Yarim district in Ibb city, Yemen. For microscopic examination (Labomed, USA), a small portion of fenugreek seed powder was mounted on a glass slide with chloral hydrate solution. A similar procedure was applied to turmeric powder, which was mixed with glycerol before examination [13].

### 2.2. Extract preparation of both plants

In a 250 mL beaker, 30 mL of 70% ethanol was used to extract around 20 g of finely ground turmeric rhizomes using a multi-mill device [14]. The mixture was divided into small flasks and subjected to sonication for 15 minutes (ultrasonic-assisted extraction)(sonicator, QsonicaQ500, UAS). After sonication, the solution was filtered, and the process was repeated twice [15]. The combined filtrates were concentrated using a rotary evaporator at 50°C to obtain the dried residue [14].

For seeds of fenugreek, 50 g of powdered material was extracted with 250 mL of 95% ethanol in a Soxhlet extractor (Labline, India) for two days [16]. The extracts were filtered through Whatman filter paper and concentrated under reduced pressure using a rotary vacuum evaporator (Buchi B-490, Germany) at 40°C. The obtained extract was stored in an airtight container for further phytochemical studies [16],as seen in Figure1.

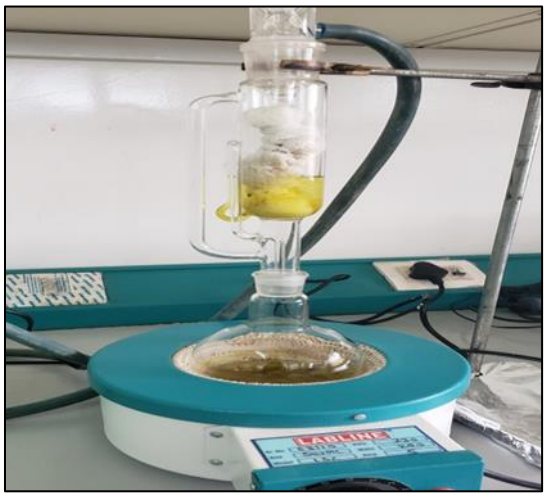


**Figure 1** Soxhlet extractor of fenugreek seeds. Soxlet (Labline, India, Sr. NO.63110)

### 2.3. Phytochemical screening

Preliminary phytochemical screening was performed on the plant extracts using conventional colorimetric methods. Small volumes of the extracts were reacted with selective reagents to indicate the presence of major classes of secondary metabolites. Alkaloids, tannins, saponins, flavonoids, and terpenoids were confirmed by characteristic changes in color or the formation of precipitates, demonstrating the diverse phytochemical profile of both plants [17].

### 2.4. Herbal cream formulation

In Table 1, the polyherbal cream was prepared in three different formulations, F1, F2, and F3. A fixed amount of turmeric and fenugreek powders (0.5 g each) was incorporated, while the concentrations of emulsifying and stabilizing agents were varied. The oily and aqueous phases were heated separately at 60°C and blended with continuous stirring until the room temperature was reached.

**Table 1** Ingredients used in cream formulation

| **Ingredients** | **Quality in 50gcream(g\ml)** | | |
|---|---|---|---|
| | **F1** | **F2** | **F3** |
| Fenugreek powder | 0.5g | 0.5g | 0.5g |
| Turmeric powder | 0.5g | 0.5g | 0.5g |
| Cetostearyl alcohol | 2g | 3g | 5g |
| Liquid paraffin | 20ml | 20ml | 21ml |
| hard paraffin | - | 0.2g | 0.5g |
| Anise oil | - | 0.5ml | 0.5ml |
| Sodium methylparaben | 0.05g | 0.05g | 0.05g |
| Sodium propylparaben | 0.01g | 0.01g | 0.01g |
| Sodium lauryl sulphate | - | 0.5g | 0.5g |
| Distilled water | q.s (Quantity sufficient) | q.s (Quantity sufficient) | 21.8ml |

### 2.5. Herbal cream evaluation

The prepared herbal cream was checked for uniformity and homogeneity by simple visual and tactile observation [14]. Its pH was measured by dispersing 0.5 g of cream in 50 mL of distilled water and recording the value with a calibrated pH meter at room temperature [18]. Microbial safety was evaluated using the streak plate method against control samples [14].

### 2.6. Stability study

The stability of the herbal cream was studied for three months. After production, the appearance and pH value of the cream were regularly evaluated, and the stability of the developed herbal cream was assessed under various temperature and humidity conditions, specifically at 30°C with 65% humidity, 40°C with 70% humidity, and 25°C [19].

### 2.7. In vivo animal study (anti-inflammatory activity)

20 adult male albino rats weighing 150-200 g were housed in the animal unit at the University of Science and Technology in Sana'a, Yemen. They were kept under standard laboratory conditions, with a temperature of 25 ± 2°C and a 12-hour dark and 12-hour light cycle. Rats had access to a standard dry pellet diet and tap water [11]. All animal procedures will be performed by the Guide for the Care and Use of Laboratory Animals published by the US National Institutes of Health. All efforts will be exerted to minimize animal suffering. All the experiments will be approved by the Ethical Committee, University of Sana'a (Approval No. 433-Date15-02-2025)

Formalin-induced rat edema 20 adult albino rats were divided into 4 groups [20].

Rats were randomly assigned into four groups as follows:5 rats in each group [21], as represented in Tablet (2).

**Table 2** Experimental Grouping and treatment protocols of Rats

| Groups | Treatment |
|---|---|
| Group I | Normal control group that was treated with distilled water from the first day to 6th day. |
| Group II | Mixed plant extracts group that treated a single daily of mixed plant extracts(1% *Curcuma longa* [22] and 1% *Trigonella foenum-graecum*[23] from the first day to 6th day. |
| Group III | herbal cream –treated group that rats were treated a single daily herbal cream (0.5g\50g of *Curcuma longa* [22] and 0.5g\50g *Trigonella foenum-graecum* [23]from the first day to 6th day. |
| Group IV | Topical Betamethasone-valerate treated group that rats were treated with a single daily dose of cream 0.1% [24] from the first day to 6th day. |

After anesthesia by ketamine (50 mg/kg) [25], the skin on the back was scraped and disinfected with 70% ethanol. The rat edema was induced by injecting 50 µL of 2.5% formalin (Strathclyde, India) (dissolved in 0.9% normal saline) subcutaneously into the plantar surface [26] with subsequent measurements taken over 6 days [20]. Animals received daily treatment with mixed plant extracts, cream, and betamethasone valerate (Shaphco-Yemen), followed by the calculation of edema using a vernier caliper [26].

### 2.8. Analysis of Statistics

Results were expressed as mean ± standard deviation (SD). Statistical analyses were performed using GraphPad Prism software (version 8). Data for categorical variables were presented as mean and SD, and differences were considered statistically significant at $p < 0.05$.

## 3. Results

### 3.1. Yield and Microscopic Identification

The extraction yield was 7% for turmeric and 6% for fenugreek. Microscopic examination revealed characteristic features, including the presence of hypo-epidermal cells in fenugreek and cork cells in turmeric, as shown in Figure 2.

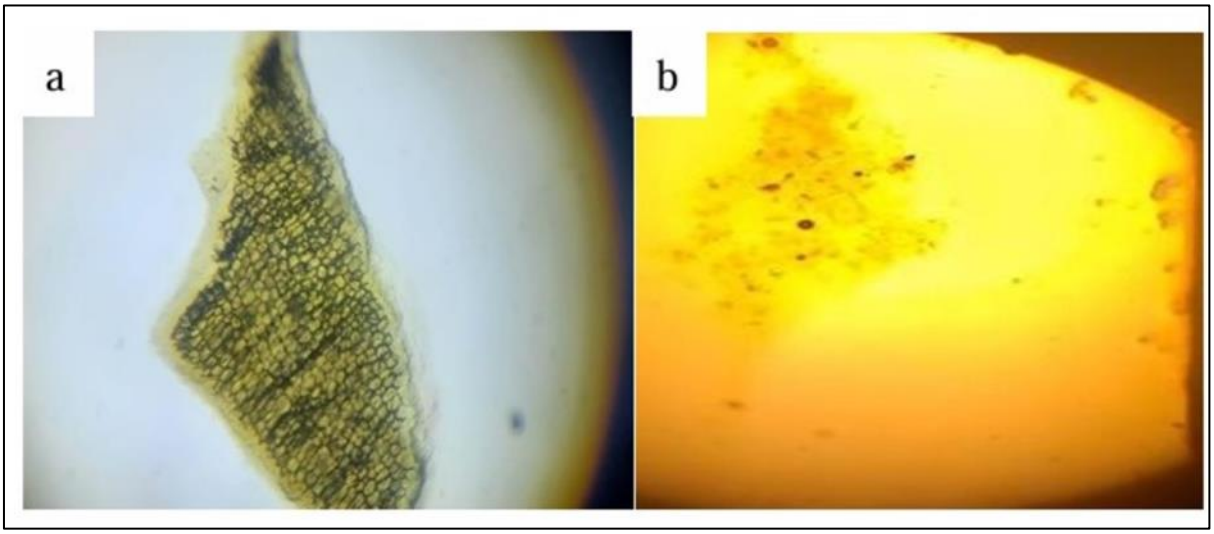


**Figure 2** Microscope picture of both plant, a) fenugreek ,b) turmeric

### 3.2. Phytochemical test results

Phytochemical screening revealed that both Fenugreek and Turmeric contained alkaloids and flavonoids. Saponins and tannins were detected only in Fenugreek, while terpenoids were present exclusively in Turmeric, as shown in Table (3).

**Table 3** Results of phytochemical tests for both plant

| Types | Fenugreek | Turmeric |
|---|---|---|
| Alkaloids | + | + |
| Tannins | + | - |
| Saponins | + | - |
| Flavonoids | + | + |
| Terpenoids | - | + |

### 3.3. Cream formulation results

*3.3.1. Formulation*

in Figure (3), three different formulations were done from both plant extract, and the formula (F1) was separated into two phases after a few days of formulation. The formula (F2) was stable and had an elegant appearance, but it was too soft and greasy when applied on skin. The most stable, elegant, easy-to-apply formula was number three(F3), it was the formula for evaluation and tests, as shown in Figure 3.


**Figure 3** Different cream formulas. T1(formula no.1), T2 (formula no. 2),T3 (formula no. 3)

*3.3.2. Tests of cream*

The formulated herbal cream exhibited an elegant appearance, characterized by a bright yellow color, a smooth texture, and ease of washing. At room temperature, the pH of the cream was measured at 6.01. Furthermore, testing for microorganisms revealed no evidence of pathogenic microbial growth after a 24 hour incubation period at 37 degrees Celsius.

*3.3.3. Stability study*

The formulation of cream had almost constant pH, homogeneous, emollient, non-greasy during the stability period, as represented in Table (4).

**Table 4** Results of stability tests of herbal cream among three months

| Days | Temperature\ Relative Humidity | Parameter | | | | |
|---|---|---|---|---|---|---|
| | | pH | Homogeneity | Spread-ility | Colour\ odour | Texture |
| 0 | R (25oC) | 6.01 | ++ | ++ | NC | NG |
| | 30oC\65% | 6.01 | ++ | ++ | NC | NG |
| | 40oC\70% | 6.01 | ++ | ++ | NC | NG |

| | | | | | | |
|---|---|---|---|---|---|---|
| 30 | R (25oC) | 7.01 | ++ | ++ | NC | NG |
| | 30oC\65% | 7.02 | ++ | ++ | NC | NG |
| | 40oC\70% | 7.03 | ++ | ++ | NC | NG |
| 60 | R (25oC) | 6.61 | ++ | ++ | NC | NG |
| | 30oC\65% | 6.90 | ++ | ++ | NC | NG |
| | 40oC\70% | 6.83 | ++ | ++ | NC | NG |
| 90 | R (25oC) | 5.60 | ++ | ++ | NC | NG |
| | 30oC\65% | 6.51 | ++ | ++ | NC | NG |
| | 40oC\70% | 5.79 | + | + | SC | NG |

R= Real conditions NC =No Change NG=Non greasy SC= Slightly Change

*3.3.4. Animal experimental results*

During the six days of treatment, the contraction of inflammation was monitored in all groups (control, herbal cream, mixed extracts, and betamethasone). The progressive reduction in inflammation size, with significant differences between treatments, represented in Figure (4).

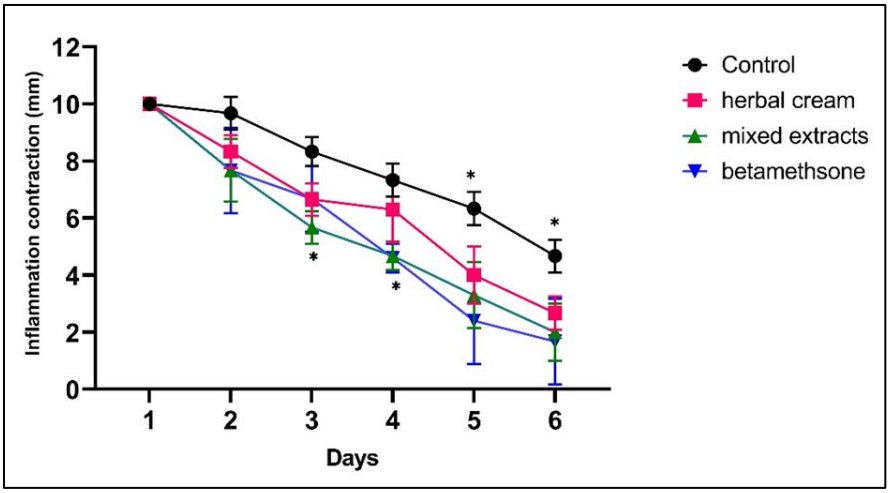


**Figure 4** Time-dependent changes in inflammation contraction (mm) over 6 days in rats (n=5/group) *treated* with herbal cream, mixed extracts, or betamethasone compared with the control. Significant differences were observed on day 3 (control vs. mixed extract, $p<0.02$), day 4 (control vs. mixed extract and betamethasone, $p<0.02$), and day 5 (control vs. mixed extract $p<0.02$)

## 4. Discussion

This study evaluated the extraction yield, phytochemical profile, formulation stability, and anti-inflammatory activity of turmeric and fenugreek extracts. The extraction yield of turmeric was 7%, while fenugreek yielded 6%, depending on the extraction method. These values are within the range of previous studies [27], although variations in reported yields and phytochemical content are common due to differences in solvent systems, plant sources, and environmental conditions. In our analysis, fenugreek showed alkaloids, flavonoids, and tannins, while other studies also reported terpenoids, steroids, and amino acids. Such differences emphasize the importance of standardization in herbal research.

The microscopic features of both plants further supported their correct botanical identification, aligning with other reports [28]. This step is essential for quality control in herbal formulations to ensure reproducibility and reliability.

Formulation experiments showed that cream F3 was the most stable and acceptable preparation. F1 separated into layers, likely due to the absence of sufficient emulsifying agents which was dependent on fenugreek saponins, while F2 was oily on application. F3 maintained good spreadability, washability, and bio-adhesion, with no visible phase separation. The pH remained within the skin-friendly range (4-7), and stability studies confirmed no major physical

changes after three months of storage at various temperatures. Only minor fluctuations in pH were noted, consistent with previous reports that fenugreek-based creams are more stable at moderate storage temperatures [29].

Animal experiments demonstrated that both the herbal cream and the crude extract reduced edema effectively, with outcomes comparable to betamethasone. The crude extract produced the fastest initial reduction in inflammation, but the cream provided a more sustained effect over six days. By the final day, the herbal cream showed results similar to betamethasone, indicating its therapeutic potential. These findings support earlier studies where curcumin reduced wound size and inflammation, and fenugreek extracts provided additional anti-inflammatory activity [30].

The synergistic action of bioactive compounds such as curcuminoids and flavonoids likely explains the observed effects. The ability of the polyherbal cream to match the efficacy of a corticosteroid suggests that it could serve as a safe, natural alternative or adjunct treatment for inflammatory skin conditions.

### 4.1. Strengths and Limitations

The study proved that *Curcuma longa* and *Trigonella foenum-graecum* extracts were successfully formulated and evaluated, and the cream demonstrated good physicochemical stability over a three-month storage period. Also, in vivo evaluation using the formalin-induced paw edema model in rats showed significant anti-inflammatory activity. The polyherbal cream exhibited comparable efficacy to betamethasone, the standard anti-inflammatory reference drug. Findings provide scientific support for integrating traditional herbal medicine into modern topical therapies for inflammatory skin conditions. However, some limitations must be acknowledged: the study showed only a single formulation type (cream) rather than other typical dosages (gel, spray, or powder). It did not investigate the precise molecular mechanism underlying the anti-inflammatory activity of turmeric and fenugreek extract and did not measure biomarkers of inflammation (cytokines, oxidative stress markers). It did not contain qualitative analysis for both extracts (HPLC, GC). Also, histopathology lesion was absent. Overall, while the results are promising, further in-depth studies are necessary.

## 5. Conclusion

In conclusion, the combination of turmeric and fenugreek extracts in a topical cream resulted in a stable formulation with significant anti-inflammatory activity in vivo. While the findings are promising, further studies with larger animal groups, quantitative analysis of phytochemicals, and eventual clinical trials are necessary to establish long-term safety and efficacy.

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of ethical approval*

All animal procedures will be performed by the Guide for the Care and Use of Laboratory Animals published by the US National Institutes of Health. All efforts will be exerted to minimize animal suffering. All the experiments will be approved by the Ethical Committee, University of Sana'a (Approval **No. 433-Date15-02-2025)**

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