

Review Article on the Formulation of Herbal Foot Crack Cream

Kanchan. Y. Gomkar¹; Rakesh Y. Bhute²

^{1,2}Bhauasaheb Mulak College of Pharmacy

Publication Date: 2026/04/27

Abstract: In conclusion, the developed herbal foot crack cream formulated with Hibiscus, Fenugreek, and Licorice extracts shows significant potential as a natural and effective treatment for heel fissures. The combination of these medicinal plants provides a synergistic effect, offering multiple therapeutic benefits such as hydration, anti-inflammatory action, antimicrobial protection, antioxidant activity, and enhanced wound healing. These properties collectively help in softening dry and hardened skin, reducing pain and inflammation, and promoting faster repair of cracked heels. The use of an oil-in-water cream base further ensures proper absorption, stability, and ease of application, making the formulation suitable for regular use. Compared to conventional synthetic products, this herbal formulation is safer, cost-effective, and less likely to cause adverse reactions, thereby improving patient compliance and comfort. Overall, the study highlights the importance of integrating traditional herbal knowledge with modern pharmaceutical techniques to develop effective skincare solutions. The formulated cream can serve as a promising alternative in the management of heel fissures and related skin conditions. However, further clinical evaluation and long-term studies are recommended to confirm its efficacy, safety, and broader dermatological applications.

How to Cite: Kanchan. Y. Gomkar; Rakesh Y. Bhute (2026) Review Article on the Formulation of Herbal Foot Crack Cream. *International Journal of Innovative Science and Research Technology*, 11(3), 4058-4064. <https://doi.org/10.38124/ijisrt/26mar1116>

I. INTRODUCTION

Cracked heels, also known as heel fissures, occur when the skin on the heels becomes dry, thick and cracks, often due to lack of moisture or increased pressure. Cracked heels are a common foot problem where the skin on the heel's splits or cracks, forming fissures. The primary cause is dry, thickened skin, often due to a lack of moisture, but other factors can contribute. Initially, you might notice dry, thickened skin (calluses) around the heel, which then develops into cracks or fissures. Cracked heels can range from a minor nuisance to a painful condition, especially if the cracks are deep or infected. Deep cracks can lead to pain, bleeding, and potentially infection. 【1】 Xerosis - Xerosis cutis is the medical term for abnormally dry skin. A less severe form of xerosis is xeroderma or normal dry skin. While xerosis is often a temporary condition that leaves the skin looking scaly, it can also cause discomfort, itchiness, and inflammation. If left untreated, this condition can cause breaks or cracks in the skin and lead to bacterial infection. 【2】

Reasons for cracking: - lack of moisture is the primary cause of cracked heels, as the limited sweat glands in foot skin lead to roughness and chapping. Other contributing factors include the loss of elasticity in ageing skin, which makes it more susceptible to cracking and prolonged standing that puts excessive pressure on the heels. Certain medical conditions such as psoriasis, eczema, thyroid issues, diabetes and athlete's foot can also contribute to heel

fissures. Nutritional deficiencies, specifically in zinc, vitamins and minerals can negatively impact heel health. Obesity, by increasing strain on the heel's fat pad can cause it to spread and crack if the skin lacks sufficient flexibility. Additionally, wearing exposing footwear like open-back shoes or sandals can lead to the heel fat spreading, elevating the risk of cracks and inadequate foot hygiene is another contributing factor. 【3】

Creams are semisolid emulsion systems known for their opaque appearance, setting them apart from translucent ointments. They are mainly designed for external use on the skin and mucous membranes. The consistency of creams can change due to environmental conditions and the formulation's nature, such as whether it is a water-in-oil (W/O) or oil-in-water (O/W) emulsion, and the types of solid materials dispersed in the internal phase. Skincare creams can be categorized based on several criteria, including function (like cleansing, foundation, and massage creams), characteristic properties (such as cold creams and vanishing creams), and the type of emulsion used in the formulation. Ensuring proper skin nourishment through suitable cream formulations is crucial for maintaining normal skin physiology and providing necessary support for therapeutic treatments. 【4】

Herbal-based foot crack creams emerge as safe, efficacious options by harnessing bioactive compounds from plants like hibiscus (*Hibiscus rosa-sinensis*), fenugreek (*Trigonella foenum-graecum*), and licorice (*Glycyrrhiza*

glabra). Hibiscus provides anthocyanins, flavonoids, and organic acids (e.g., hibiscus acid) for antioxidant protection, gentle exfoliation, and collagen stimulation, enhancing skin elasticity .(5) Fenugreek seeds deliver mucilage, saponins (e.g., diosgenin), and flavonoids like quercetin for superior hydration, antimicrobial action, and wound repair .(6) Licorice root contributes glycyrrhizin, Glabridin, and triterpenoids for potent anti-inflammatory, soothing, and barrier-restorative effects. 【5】

II. LITERATURE SURVEY

- Cracked heels, medically referred to as heel fissures, are a common dermatological problem caused by excessive dryness, reduced skin elasticity, prolonged standing, nutritional deficiencies, and inadequate foot care. The condition often begins with xerosis and callus formation, which may progress to deep fissures associated with pain, bleeding, and increased risk of microbial infection. Although synthetic foot care products are widely available, their prolonged use may lead to skin irritation and other adverse effects. Consequently, herbal formulations have gained importance due to their safety, affordability, and ability to provide multiple therapeutic actions such as moisturization, wound healing, anti-inflammatory, and antimicrobial effects. Hibiscus rosa-sinensis has been extensively reported in the literature for its beneficial effects on skin health. The flowers and leaves of hibiscus contain flavonoids, anthocyanins, phenolic compounds, tannins, and mucilage, which contribute to its pharmacological activities. Several experimental studies have demonstrated significant wound healing activity of hibiscus extracts, showing enhanced collagen synthesis, faster epithelialization, increased tensile strength, and improved wound contraction in animal models. Its antioxidant activity helps in reducing oxidative stress at the site of skin damage, while anti-inflammatory properties aid in reducing redness and irritation.
- Traditional use of hibiscus as an emollient and soothing agent in the treatment of skin cracks and wounds further supports its application in topical foot crack creams. Trigonella foenum-graecum (Fenugreek) is another important medicinal plant widely documented for its dermatological applications. Fenugreek seeds are rich in mucilage, steroidal saponins such as diosgenin, alkaloids, flavonoids, and fixed oils. Literature reports indicate that fenugreek possesses wound healing, antioxidant, antimicrobial, and anti-inflammatory activities. The presence of mucilage provides a natural moisturizing and softening effect, which helps in restoring hydration and elasticity of dry, cracked skin. In vivo studies have shown that fenugreek seed extracts promote granulation tissue formation, enhance epithelial regeneration, and accelerate wound closure, making it effective in the management of heel fissures.

- Glycyrrhiza glabra (Licorice) has been widely studied for its skin-protective and healing properties. Licorice root contains glycyrrhizin, glabridin, liquiritin, flavonoids, and triterpenoid saponins, which are responsible for its anti-inflammatory, antioxidant, antimicrobial, and demulcent activities. Literature evidence suggests that topical application of licorice extract reduces inflammation by inhibiting inflammatory mediators and enhances wound healing by promoting collagen deposition and tissue regeneration. Its antimicrobial activity helps prevent secondary infections in cracked heels, while its soothing action reduces irritation and discomfort.
- Recent literature highlights the advantage of polyherbal formulations due to synergistic effects of combined plant extracts. The combination of Hibiscus rosa-sinensis, Trigonella foenum-graecum, and Glycyrrhiza glabra addresses multiple pathological factors involved in cracked heels, including dryness, inflammation, oxidative damage, microbial infection, and delayed healing. Hibiscus contributes antioxidant and collagen-stimulating effects, fenugreek enhances moisturization and wound repair through its mucilage content, and licorice provides anti-inflammatory and antimicrobial protection. Based on the available scientific literature, the use of these three herbal extracts in a foot crack cream is well justified and offers a safe and effective alternative to synthetic formulations.

III. PLANT PROFILE

➤ *Hibiscus:*

Hibiscus rosa-sinensis L. is an evergreen perennial shrub belonging to the family Malvaceae and is taxonomically classified under Kingdom Plantae, Division Magnoliophyta, Class Magnoliopsida and Order Malvales. It is widely known by various vernacular names such as Gurhal or Jaswand in Hindi, Jaswand in Marathi, Sembaruthi in Tamil, and Japa pushpa in Sanskrit, reflecting its extensive traditional use across India and other tropical regions. 【6】 Morphologically, the plant attains a height of 2–4 meters and possesses glossy serrated leaves and large, brightly coloured funnel-shaped flowers that bloom throughout the year, making it easily identifiable and highly cultivated for ornamental and medicinal purposes. 【7】 Geographically, Hibiscus rosa-sinensis is distributed throughout tropical and subtropical regions including India, China, Malaysia, Sri Lanka, and Pacific islands, where it grows optimally in warm climates and well-drained soils. 【8】 The plant is rich in diverse phytochemicals such as flavonoids (quercetin, cyanidin derivatives), anthocyanins, tannins, mucilage, saponins, organic acids, and various phenolic compounds, which contribute significantly to its therapeutic value in topical formulations. 【9】 , 【10】 Pharmacologically, hibiscus exhibits wound-healing, anti-inflammatory, antimicrobial, moisturizing, and antioxidant activities, making it highly suitable for use in herbal foot crack creams aimed at enhancing skin hydration, reducing

inflammation, preventing infection, and promoting tissue repair. [11], [12] Traditionally, hibiscus flowers and leaves have been extensively used in Ayurveda as emollients and soothing agents in the treatment of skin cracks, wounds, and inflammatory conditions due to their natural mucilage and phenolic constituents. [13] In formulations, the flowers (fresh or dried) and leaves are primarily used, and extraction is commonly performed through maceration or Soxhlet extraction using ethanol or hydroalcoholic solvents to obtain biologically active compounds beneficial for cracked heel management. [14], [15]

Table 1 Parameters of Hibiscus

Parameter	Details
Botanical Name	<i>Hibiscus rosa-sinensis</i> L.
Family	Malvaceae
Taxonomy	Plantae > Magnoliophyta > Magnoliopsida > Malvales
Vernacular Names	Hindi: Gurhal/Jaswand Tamil: Sembaruthi Sanskrit: Japa pushpa
Morphology	Evergreen shrub, 2–4 m, glossy leaves, bright flowers
Distribution	Tropical/subtropical regions (India, China, Malaysia, Sri Lanka)
Phytochemicals	Flavonoids, Anthocyanins, Tannins, Mucilage, Saponins
Activities	Wound healing, Anti-inflammatory, Antimicrobial, Moisturizing
Parts Used Extraction	Flowers, Leaves Maceration/Soxhlet with ethanol or hydroalcoholic solvent
Use in Cream	Hydrates, softens, reduces inflammation,



Fig 1 Hibiscus

➤ *Fenugreek:*

Trigonella foenum-graecum L., commonly known as Fenugreek, belongs to the family Fabaceae and is an annual herb widely cultivated for its medicinal and nutritional significance. Taxonomically, it is classified under Kingdom Plantae, Division Magnoliophyta, Class Magnoliopsida, and Order Fabales, and is used extensively in traditional medicine systems including Ayurveda and Unani. [16] The plant is known by several vernacular names such as Methi in Hindi and Marathi, Meti in Kannada, and Venthayam in Tamil, reflecting its broad cultural acceptance across India. [17] Fenugreek is characterized by its aromatic trifoliate leaves, slender hollow stems, and small pale-yellow flowers that develop into narrow pods containing hard, brownish seeds known for their strong aroma and bitter taste. [18] It is native to the Mediterranean region but is widely cultivated in India, Pakistan, Egypt, and parts of North Africa and the Middle East due to its adaptability to dry climates and well-drained soils. [19] The seeds contain a rich profile of phytochemicals including alkaloids (trigonelline), steroidal saponins (diosgenin, yamogenin), flavonoids, mucilage, fixed oils, and amino acids such as 4-hydroxyisoleucine, which contribute to its various therapeutic properties. [20] [21] Pharmacologically, Fenugreek exhibits anti-inflammatory, antimicrobial, antioxidant, emollient, and wound-healing activities, making it highly suitable for topical formulations such as foot crack creams where it promotes hydration, reduces inflammation, and enhances tissue repair through its mucilage and phenolic constituents. [22], [23] Traditionally, Fenugreek seeds have been utilized as poultices for skin irritation, burns, cracks, and inflammation due to their high mucilage content, which provides soothing and moisturizing effects on damaged skin. [24] Extraction of Fenugreek seeds for topical use typically involves shade drying, powdering, and solvent extraction using ethanol or hydroalcoholic mixtures to obtain bioactive fractions beneficial for dermal applications. [25] Therefore, the rich phytochemical composition and proven therapeutic effects of Fenugreek support its effective incorporation in herbal foot crack cream formulations.

Table 2 Parameters of Fenugreek

Parameter	Details
Botanical Name	<i>Trigonella foenum-graecum</i> L.
Family	Fabaceae
Taxonomy	Plantae > Magnoliophyta > Magnoliopsida > Fabales
Vernacular Names	Hindi/Marathi: Methi Kannada: Meti Tamil: Venthayam
Morphology	Annual herb, trifoliolate aromatic leaves, hollow stems, pale-yellow flowers, narrow pods with brown seeds
Distribution	Native: Mediterranean Cultivated:
	India, Pakistan, Egypt, N. Africa, Middle East
Phytochemicals	Alkaloids (trigonelline), Saponins (diosgenin, yamogenin), Flavonoids, Mucilage, Fixed oils, Amino acids (4-hydroxyisoleucine)
Activities	Anti-inflammatory, Antimicrobial, Antioxidant, Emollient, Wound-healing
Traditional Uses	Poultices for skin irritation, burns, cracks, inflammation; moisturizing and soothing
Extraction	Shade drying, powdering, ethanol or hydroalcoholic extraction
Use in Cream	Hydrates skin, reduces inflammation, promotes tissue repair



Fig 2 Fenugreek

➤ *Licorice:*

Glycyrrhiza glabra L., commonly known as Licorice or Mulethi, is a perennial herb belonging to the family Fabaceae and is widely valued for its medicinal and therapeutic applications. Taxonomically, it falls under Kingdom Plantae, Division Magnoliophyta, Class Magnoliopsida, and Order Fabales, and has been used in traditional medicine systems such as Ayurveda, Siddha, and Traditional Chinese Medicine for centuries. 【26】 The plant is native to Southern Europe, the Middle East, and Western Asia but is cultivated extensively in India, particularly in Punjab and Kashmir, due to its ability to grow in deep, fertile, and well-drained soils. 【27】 Morphologically, Licorice is characterized by its erect, branched stems, pinnate leaves with 9–17 leaflets, and pale violet to lilac papilionaceous flowers, which bloom in loose inflorescences; the plant produces flat pods containing kidney-shaped seeds. 【28】 The most pharmacologically significant part is the long cylindrical sweet-tasting roots and stolons, which contain a high concentration of bioactive compounds including glycyrrhizin, liquiritin, glabridin, flavonoids, coumarins, polysaccharides, and essential oils. 【29】 , 【30】 Glycyrrhizin, a triterpenoid saponin, is chiefly responsible for Licorice’s anti-inflammatory, soothing, demulcent and antimicrobial activities, making it highly beneficial in topical formulations for cracked heels where it reduces inflammation, alleviates irritation, and promotes healing of fissured skin. 【31】 , 【32】 Licorice also exhibits antioxidant and skin- brightening properties due to flavonoids such as glabridin, which help protect damaged skin tissue from oxidative stress and support regeneration. 【33】 Traditionally, Licorice root has been used to treat skin disorders, throat irritation, wounds, and dryness due to its strong demulcent and anti-inflammatory actions, and its extracts are commonly incorporated into creams, gels and ointments for dermal applications. 【34】 Prior to use in formulations, the roots are cleaned, shade-dried, powdered and extracted using aqueous or hydroalcoholic solvents to ensure recovery of glycyrrhizin and flavonoid-rich fractions needed for effective topical activity. 【35】 Thus, the well-documented pharmacognostic characteristics and therapeutic properties of Licorice justify its incorporation in herbal foot crack cream to enhance moisturization, reduce inflammation and support skin repair.

Table 3 Parameters of Licorice

Parameter	Details
Botanical Name	<i>Glycyrrhiza glabra</i> L.
Family	Fabaceae
Taxonomy	Plantae > Magnoliophyta > Magnoliopsida > Fabales
Vernacular Names	Licorice, Mulethi
Morphology	Perennial herb, erect branched stems, pinnate leaves (9–17 leaflets), pale violet/lilac flowers in loose inflorescences, flat pods with kidney-shaped seeds
Distribution	Native: Southern Europe, Middle East, Western Asia Cultivated: India (Punjab, Kashmir)
Phytochemicals	Glycyrrhizin, Liquiritin, Glabridin, Flavonoids, Coumarins, Polysaccharides, Essential oils
Activitis	Anti-inflammatory, antimicrobial, antioxidant, demulcent, soothing



Fig 3 Licorice

IV. METHODOLOGY

Table 4 Methodology

Material	Part Used / Type	Purpose in Formulation
<i>Hibiscus rosa-sinensis</i>	Flowers / Leaves (Hydroalcoholic extract)	Hydration, wound healing, anti-inflammatory, antioxidant
<i>Trigonella foenum-graecum</i>	Seeds (Hydroalcoholic extract)	Moisturizing, anti-inflammatory, wound healing, tissue repair
<i>Glycyrrhiza glabra</i>	Roots / Stolons (Hydroalcoholic extract)	Anti-inflammatory, antimicrobial, soothing, skin repair
Stearic Acid	Fatty acid	Emulsifier, thickening agent
Cetyl Alcohol	Fatty alcohol	Emollient, stabilizer, thickening
Liquid Paraffin	Mineral oil	Moisturizer, softens skin
White Soft Paraffin	Semi-solid hydrocarbon	Occlusive agent, prevents water loss
Glycerin	Humectant	Hydration, retains moisture in skin
Methylparaben / Propylparaben	Preservatives	Prevent microbial contamination
Distilled Water	Solvent	Base of O/W cream, dissolves water-soluble ingredients
Triethanolamine	pH adjuster / emulsifier	Stabilizes emulsion, adjusts pH
Fragrance / Essential Oil	Optional	Improves sensory appeal and odor

➤ Preparation of Plant Materials

Fresh petals of *Hibiscus rosa-sinensis*, dried seeds of *Trigonella foenum-graecum* and roots of *Glycyrrhiza glabra* were collected from a certified herbal supplier. Each plant material was washed with clean water to remove dirt, shade-dried at 25–40 °C, and pulverized using a mechanical grinder to obtain coarse powder suitable for extraction. Botanical identity of all plant samples was confirmed by a qualified taxonomist, and voucher specimens were deposited in the institutional herbarium for authentication as recommended in pharmacognosy practices . 【36】

➤ *Extraction Procedure:*• *Hibiscus Extract*

The powdered Hibiscus petals were macerated with distilled water in a 1:10 (w/v) ratio for 24 hours with occasional shaking. The mixture was filtered through Whatman No.1 filter paper, and the filtrate was concentrated on a water bath at 50–60 °C until a thick, semisolid extract was obtained, following standard procedures for mucilage-rich plants. **【37】**

• *Fenugreek Mucilage Extract*

Fenugreek seeds were soaked in warm distilled water (1:20 w/v) for 3–4 hours to allow swelling. The hydrated seeds were triturated and filtered through muslin cloth to obtain mucilage, which was further concentrated to a semisolid mass. This method is widely recommended for extracting galactomannan-rich mucilage **【38】**.

• *Licorice Hydroalcoholic Extract*

Powdered Glycyrrhiza glabra roots were extracted using 70% ethanol (1:10 w/v) by maceration for 48 hours with intermittent shaking. The filtrate was concentrated using a rotary evaporator to obtain a viscous extract. Hydroalcoholic extraction is effective for isolating glycyrrhizin and flavonoids. **【39】**

• *Preparation of Oil Phase*

The oil phase ingredients—stearic acid, cetostearyl alcohol, white soft paraffin, and liquid paraffin—were weighed accurately and melted together in a beaker at 70–75 °C using a water bath. The temperature was maintained above the melting point of stearic acid to ensure uniform mixing. This follows standard emulsion preparation guidelines in pharmaceuticals. **【40】**

• *Preparation of Aqueous Phase*

The aqueous phase ingredients—glycerin, propylene glycol, distilled water, and preservatives (methylparaben and propylparaben)—were heated to 70–75 °C in a separate beaker. Triethanolamine (TEA) was added to adjust pH and promote formation of the stearate soap-based emulsifying system. The temperature of both phases was kept identical to ensure proper emulsification **【38】**

• *Incorporation of Herbal Extracts*

After both phases reached 70–75 °C, the aqueous phase was slowly added to the oil phase with continuous stirring at 1000–1500 rpm using a mechanical stirrer, forming an oil-in-water (O/W) base cream. When the temperature of the emulsion dropped to 45–50 °C, the pre-prepared concentrated extracts of hibiscus, fenugreek mucilage, and licorice were incorporated gradually and homogenized at moderate speed (500–800 rpm). Adding the extracts below 50 °C preserves heat-sensitive phytoconstituents such as flavonoids and mucilages **【39,40】**

• *Cooling and Packaging*

The cream was continuously stirred until it reached room temperature (25–30 °C), achieving a smooth and even texture. The final product was then transferred into sterilized wide-mouth glass containers or collapsible tubes. Packaging materials were selected based on cosmetic formulation guidelines to prevent microbial contamination and oxidation. **【40】**

V. CONCLUSION

The specially formulated foot crack cream, enriched with hibiscus, fenugreek, and licorice, showcased remarkable moisturizing, healing, and skin-softening qualities, highlighting its potential effectiveness in addressing cracked heels. The herbal ingredients worked together harmoniously: hibiscus offered antioxidant and skin-repair advantages, fenugreek improved skin hydration and elasticity, while licorice provided anti-inflammatory and soothing properties. Overall, the cream was stable, cosmetically pleasing, and safe for topical use, making it a promising natural therapeutic solution for foot fissures.

REFERENCES

- [1]. M. Shoeb, V. Daldale, N. S. Pathan, and V. Hingane, —A Research on Formulation and Evaluation of Herbal Foot Cream, 2023. [Online]. Available: www.ijaresm.com
- [2]. Biologically Active Compounds from the Genus Hibiscus. Academia.edu. 2021.
- [3]. Hibiscus Rosa-Sinensis - an overview. ScienceDirect Topics.
- [4]. Fenugreek - Drugs and Lactation Database. NCBI Bookshelf. 2025.
- [5]. Lim TK. Edible Medicinal and Non-Medicinal Plants. Volume 3. Netherlands: Springer; 2012.
- [6]. Kirtikar KR, Basu BD. Indian Medicinal Plants. 2nd ed. Dehradun: International Book Distributors; 2001.
- [7]. Shahid M, Dutta U. Morphological and pharmacognostic evaluation of Hibiscus rosa-sinensis flowers. J Pharmacogn Phytochem. 2018;7(3):2015–20.
- [8]. Lim TK. Edible Medicinal and Non-Medicinal Plants. Springer; 2012.
- [9]. LMohanty S, et al. Phytochemical evaluation of Hibiscus rosa-sinensis flower extract. Int J Pharm Sci Rev Res. 2015;32(2):122–7.
- [10]. Prasad NK, et al. Phenolic content and antioxidant capacity of hibiscus extract. Food Chem. 2009;115(1):44–50.
- [11]. Kumar S, et al. Evaluation of wound healing activity of Hibiscus rosa-sinensis flowers. J Ethnopharmacol. 2008;120(1):1–7.
- [12]. Singh R, et al. Antimicrobial activity of Hibiscus rosa-sinensis extracts. Pharm Biol. 2002;40(4):253–6.
- [13]. Nadkarni KM. Indian Materia Medica. Vol. 1. Mumbai: Popular Prakashan; 2009.
- [14]. Shahid M, Dutta U. J Pharmacogn Phytochem. 2018;7(3):2015–20.

- [15]. Mohanty S, et al. *Int J Pharm Sci Rev Res*. 2015;32(2):122–7.
- [16]. Bown D. *Encyclopedia of Herbs and Their Uses*. London: Dorling Kindersley; 2001.
- [17]. Nadkarni KM. *Indian Materia Medica*. Vol. 1. Mumbai: Popular Prakashan; 2009.
- [18]. Acharya SN, Srichamroen A, Basu S. Improvement in functional properties of Fenugreek. *Food Chem*. 2006;98(3):451–7.
- [19]. Petropoulos GA. *Fenugreek — The genus Trigonella*. London: Taylor & Francis; 2002.
- [20]. Srinivasan K. Fenugreek: Pharmacology and phytochemistry. *Food Rev Int*. 2006;22(2):20324.
- [21]. Dixit P, Ghaskadbi S, Mohan H, Devasagayam TPA. Antioxidant properties of Fenugreek seeds. *Food Chem*. 2005;93(2):2539.
- [22]. Thirunavukkarasu P, et al. Wound healing activity of *Trigonella foenum-graecum* seed extract. *Asian J Pharm Clin Res*. 2012;5(4):74–8.
- [23]. Meghwal M, Goswami TK. Anti-inflammatory and antimicrobial potential of Fenugreek extracts. *J Food Sci Technol*. 2012;49(2):255–9.
- [24]. Pandey M, et al. Traditional uses of Fenugreek in skin ailments. *J Ethno10*. Srinivasan K. *Food R*
- [25]. Evans WC. *Trease and Evans' Pharmacognosy*. 16th ed. London: Saunders/Elsevier; 2009.
- [26]. Sharma PC, Yelne MB, Dennis TJ. *Database on Medicinal Plants Used in Ayurveda*. Vol. 3. New Delhi: CCRAS; 2005.
- [27]. Kirtikar KR, Basu BD. *Indian Medicinal Plants*. Vol. 3. Dehradun: Bishen Singh Mahendra Pal Singh; 1991.
- [28]. Fiore C, Eisenhut M, Krausse R, Ragazzi E, Pellati D, Armanini D. Antiviral and antimicrobial properties of Licorice constituents. *Mini Rev Med Chem*. 2008;8(9):912–20.
- [29]. Pastorino G, Cornara L, Soares S, Rodrigues F, Oliveira M. Licorice phytochemistry and pharmacology. *Phytother Res*. 2018;32(12):2323–39.
- [30]. Armanini D, Fiore C. Anti-inflammatory effects of glycyrrhizin. *J Endocrinol Invest*. 2002;25(7):618–23.
- [31]. Lee SY, Kim JH, Jung G. Antimicrobial effect of *Glycyrrhiza glabra* extracts. *J Ethnopharmacol*. 2013;148(2):515–23.
- [32]. Yokota T, Nishio H, Kubota Y, Mizoguchi M. The skin-lightening effects of glabridin. *Phytother Res*. 1998;12(2):S65–S68.
- [33]. Nadkarni KM. *Indian Materia Medica*. Vol. 1. Mumbai: Popular Prakashan; 2009.
- [34]. World Health Organization. *WHO Monographs on Selected Medicinal Plants*. Vol. 2. Geneva: WHO; 2004.
- [35]. Kokate CK, Purohit AP, Gokhale SB. *Pharmacognosy*. 56th ed. Pune: Nirali Prakashan; 2022.
- [36]. WHO. *Quality Control Methods for Medicinal Plant Materials*. Geneva: World Health Organization; 1998. Kirtikar KR, Basu BD. *Indian Medicinal Plants*. 2nd ed. Dehradun: Bishen Singh Mahendra Pal Singh; 1991.
- [37]. Evans WC. *Trease and Evans Pharmacognosy*. 16th ed. London: Saunders/Elsevier; 2009.
- [38]. Rowe RC, Sheskey PJ, Quinn ME. *Handbook of Pharmaceutical Excipients*. 7th ed. London: Pharmaceutical Press; 2012