



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Review Article

Review On: Anti-inflammatory Polyherbal Gel for Bacterial Skin Infections

Aakif Hashmi, Dr. Shivappa N. Nagoba*, Atiya Shaikh, Akhilesh Limaye, Shripal Kolsure Harshada Ghuge

Department Of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur.

ARTICLE INFO

Published: 29 May 2025

Keywords:

Polyherbal Gel, Wound
Healing Activity, Herb, Skin

DOI:

10.5281/zenodo.15543055

ABSTRACT

Medicinal plant is used ancient India. The study of medicinal plants used in wound healing and skin repairing and properties. The present study was prepared wound healing activity a poly herbal gel formulation. The study also aimed to evaluate the impact of polyherbalism on antimicrobial, antioxidant and anti-inflammatory effect there after ratio of ayurvedic drug was optimize according to treat the wound. Polyherbal gel are tested on organism on suitable complete agar medium in petri dishes, cup. where they are used in plant leaves, bark and route, stem etc. they are used in therapeutic purpose, wound healing, mouth ulcer, stomach ulcer, vaginal discharge, infection, diarrhea, scabies etc. Around 80 % people of India, Used in herbal (Ayurvedic property) Medicine. Ayurvedic medicine are safe not a harmful for a body, ayurvedic doctor play a vital role in our doses. Topical formulation to a fast-healing drug are directly to a site of action polyherbal gel applied to a wound, New skin tissue and grow within a cavity between the linked the particle reducing scarring a gel gradually dissolve however it losses the scaffolding support needed for the tissue to repair fully.

INTRODUCTION

Herbal formulations have gained widespread acceptance as therapeutic agents due to their diverse pharmacological activities. They have been effectively utilized in the treatment of various conditions, including antimicrobial, antidiabetic, anti-aging, anti-arthritis, antidepressant, anti-

anxiety, and anti-inflammatory disorders, as well as in the management of HIV, cirrhosis, asthma, migraine, Alzheimer's disease, and for cognitive enhancement. Gels are defined as solid or semi-solid systems composed of at least two components, where a continuous liquid phase is interspersed within a three-dimensional network formed by a gelling agent. Despite containing a

***Corresponding Author:** Dr. Shivappa N. Nagoba

Address: Department Of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur.

Email ✉: nagobashivraj@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



relatively small proportion of solids dispersed in a larger quantity of liquid, gels exhibit more solid-like characteristics due to the formation of this structured network. Topical drug delivery systems have seen a growing interest in recent years, with numerous drugs being successfully administered via this route for both localized and systemic therapeutic effects. The rigidity of gels arises from the formation of a network structure, which results from the interlocking of the gelling agent's particles. The characteristics of these particles, along with the nature of the bonds or interactions that facilitate their association, play a crucial role in determining the gel's structure and its functional properties.⁽¹⁾ Traditional medicines play a vital role in healthcare systems globally, with approximately 75 % of the world's population relying on plants and plant-derived extracts for medicinal purposes. Indian medicinal plants, in particular, exhibit a broad spectrum of pharmacological activities, attributed to the diverse classes of phytochemicals they contain. Conventional treatments for inflammation, such as non-steroidal anti-inflammatory drugs (NSAIDs) and opioids, are widely used but are often associated with significant adverse effects, including pruritus (itching) and erythema (redness). This underscores the need for safer and more effective alternatives. In this context, an investigation was undertaken to evaluate the potential synergistic anti-inflammatory effects of individual plant extracts as well as their combinations within a single dosage form. Topical gel formulations were selected as the mode of drug delivery due to their ease of application, prolonged residence time at the site of

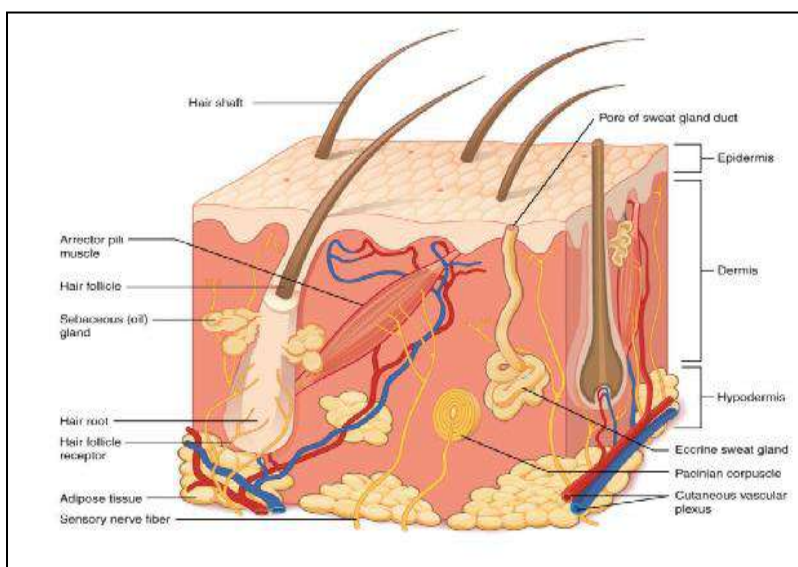
action, and reduced risk of systemic side effects compared to oral administration and other topical preparations.⁽²⁾ Since the beginning of humanity, traditional herbal remedies have been utilized to alleviate ailments and promote health. Natural preparations based on phyto-constituents have gained significant recognition as alternatives to pharmaceutical treatments for managing inflammatory diseases, arthritis, diabetes, anxiety, AIDS, and other conditions. The development of polyherbal formulations has garnered increased interest due to their historical significance, cost-effectiveness, and patient adherence. Currently, a variety of remedies are available that employ topical, biological, and systemic approaches. While some medications can relieve symptoms, they may also come with adverse side effects. Therefore, it is essential to create a treatment that is both highly effective and has minimal side effects. Natural remedies are often safer and more effective in alleviating symptoms compared to allopathic treatments. A medicinal plant is defined as one that contains compounds with pharmacological benefits or substances that can be utilized for therapeutic purposes.⁽³⁾

Anatomy And Physiology of Skin

Skin⁽⁴⁾

The skin is the largest organ of the human body, comprising three distinct layers. The outermost layer is the epidermis, followed by the dermis as the middle layer, and the innermost layer is known as the hypodermis.





Epidermis⁽⁵⁾

The epidermis is composed of epithelial cells, which include both living and dead cells. The basal layer contains rapidly dividing cells that push older cells toward the surface as they mature. The epidermis lacks a direct blood supply and instead relies on diffusion of nutrients from the dense vascular network in the underlying dermis. Epidermal cells are tightly connected by desmosomes, which maintain structural integrity. These desmosomes interact with intracellular keratin filaments, which play a crucial role in providing mechanical strength. Keratin, a key structural protein, is synthesized by these keratin filaments

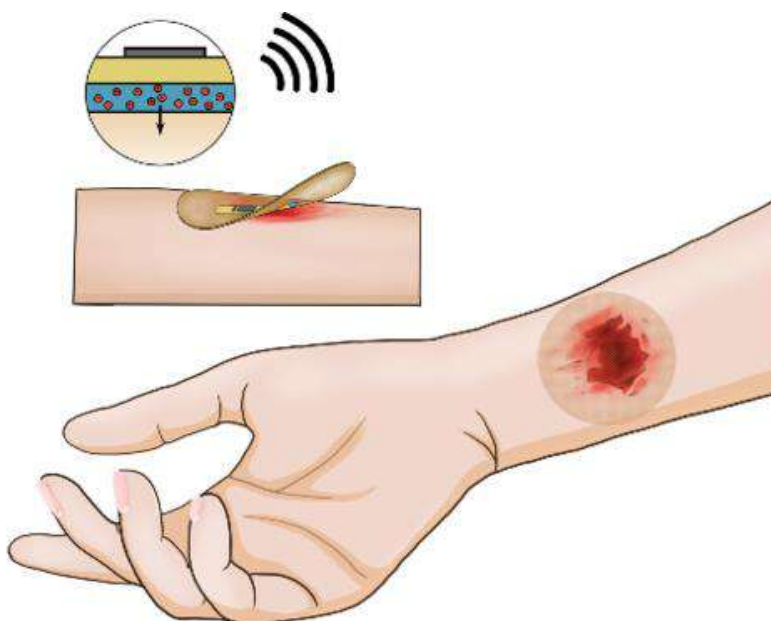
Dermis⁽⁶⁾

The dermis, located beneath the epidermis, is characterized by a dense network of fibrous connective tissue that provides elasticity and tensile strength to the skin. This strength is primarily attributed to the presence of abundant collagen fibers. Blood vessels within the dermis supply essential nutrients to both the dermis and the overlying epidermis. Additionally, the dermis

plays a vital role in thermoregulation and contains sensory nerve endings responsible for detecting pressure and pain. The average thickness of the dermis ranges from 3 to 5 millimeters.

Hypodermis

The hypodermis, also known as the subcutaneous layer, is the innermost layer of the skin and serves as a critical interface between the skin and deeper tissues such as muscles and bones. Although structures like sebaceous glands, sweat glands, and hair follicles originate in the dermis, they extend through and are functionally associated with the epidermis. Sweat glands secrete a dilute saline solution onto the skin's surface, which cools the body through evaporation, thereby playing a key role in thermoregulation. These glands are distributed throughout the body, and the amount of sweat produced is influenced by factors such as ambient temperature, physical activity, and emotional state. Sebaceous glands produce sebum, an oily secretion that is released through hair follicles onto the skin, contributing to lubrication and protection of the skin surface



Anti-inflammatory Activity

Over the past decade, the therapeutic application of herbal medicine has gained significant global momentum. This surge in interest is largely attributed to the adverse effects and toxicity associated with allopathic (conventional) medicines, which has prompted a marked increase in the number of herbal drug manufacturers. Herbal medicines, long regarded as a cornerstone of traditional medical systems, have been utilized since ancient times. Their continued use today is supported not only by their biomedical benefits but also by their deep-rooted significance in cultural and traditional beliefs across various regions of the world. These remedies have played a vital role in the maintenance of human health throughout history. Inflammation is a complex biological response to tissue injury or damage, type characterized by redness, heat, swelling, and pain. Its primary function is to localize and eliminate the causative agent and initiate the healing process. By facilitating the removal of pathogens, toxins, and foreign substances at the site of injury, inflammation prevents the spread of harmful agents to other tissues and supports their repair and

restoration of normal tissue function. In this way, inflammation serves a critical role in preserving tissue homeostasis

There are three basic stages of inflammation:

- Vasodilatation and permeability of blood vessels.
- Phagocyte migration
- Tissue repair

Cardinal Signs of Inflammation:

Rubor (Redness): Caused by increased blood flow to the affected area due to vasodilation.

Tumor (Swelling): Resulting from the accumulation of fluid in the interstitial tissues.

Calor (Heat): Due to elevated local temperature as a consequence of increased blood flow.

Dolor (Pain): Arises from the release of chemical mediators and increased pressure on nerve endings.

Functio laesa (Loss of Function): Occurs as a result of pain and swelling, which impair normal tissue activity.

Agents Responsible for Inducing Inflammation:

1. **Physical Agents:** These include external factors such as heat, cold, radiation, and mechanical trauma, all of which can cause tissue injury leading to an inflammatory response.
2. **Chemical Agents:** Both organic and inorganic toxic substances can provoke inflammation by causing cellular damage or disrupting normal physiological functions.
3. **Infectious Agents:** Pathogenic microorganisms, including bacteria, viruses, and the toxins they produce, are significant contributors to inflammation as they trigger immune responses aimed at eliminating the infection.

Types of Inflammation:

A) Acute Inflammation:

Acute inflammation is indeed a rapid response and short-term response to tissue injury or infection, representing the body's initial defensive

reaction.

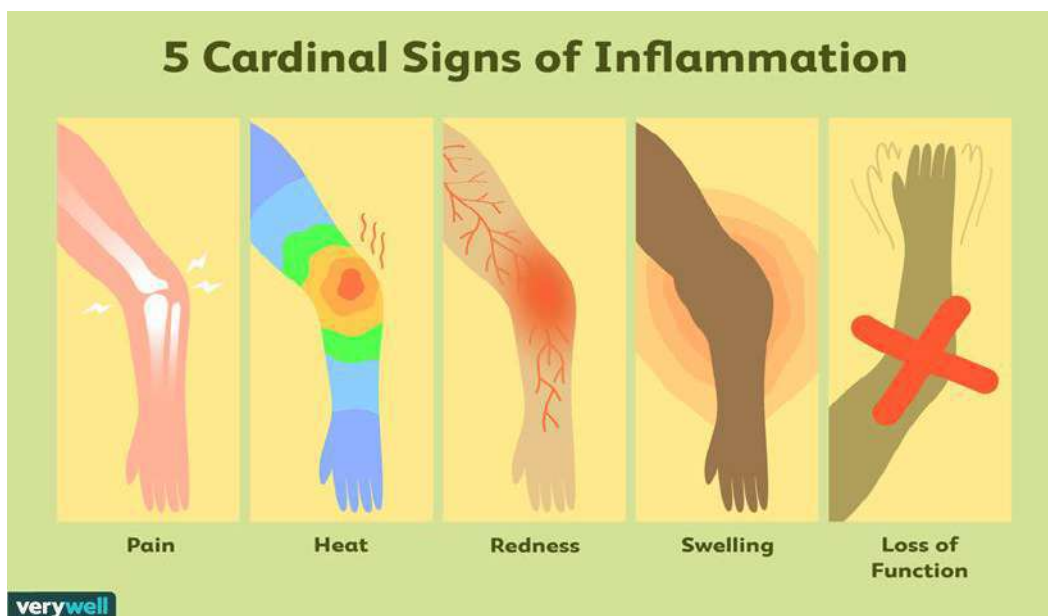
Key characteristics of acute inflammation include:

- a) Accumulation of fluid and plasma proteins at the site of injury (exudation),
- b) Activation of platelets within the vasculature,
- c) Predominance of polymorphonuclear neutrophils (PMNs) as the primary inflammatory cells.

B) Chronic Inflammation:

Chronic inflammation is a prolonged and persistent inflammatory response characterized by simultaneous tissue destruction and healing processes occurring at the same site. It may arise due to:

- a) Progression of an acute inflammatory response into a chronic phase,
- b) Some infections, such as chronic bacterial or viral infections, can lead to repeated episodes of acute inflammation.
- c) De novo onset of chronic inflammation without a preceding acute phase.⁴



Advantages Of Topical Drug Delivery⁽⁷⁾

- Facilitates prompt discontinuation of therapy when necessary.

- By-passes first-pass hepatic metabolism, enhancing drug bioavailability.
 - Offers a relatively larger surface area for drug application compared to buccal or nasal routes.
 - Enables targeted drug delivery to specific anatomical sites.
 - Allows effective use of drugs with a short biological half-life through sustained or controlled release.
 - Enhances both physiological and pharmacological responses due to improved delivery dynamics.
 - Improves patient compliance through non-invasive and convenient administration.
 - Supports suitability for self-administration, increasing accessibility and ease of use.
2. It should demonstrate thixotropic behavior, breaking down easily under applied shear or agitation (e.g., shaking of the container).
 3. The formulation should consist of chemically inert components to ensure stability and compatibility.
 4. The gel should be non-sticky to enhance user comfort and ease of application.
 5. It must remain chemically non-reactive with other components within the formulation.
 6. The product should exhibit consistent and reliable performance throughout its shelf life.
 7. It should be non-irritating and well-tolerated by the skin or any site of application

Disadvantages Of Topical Delivery⁽⁷⁾

- Potential for skin irritation or contact dermatitis due to the active pharmaceutical ingredient and/or excipients.
- Limited permeability of certain drug molecules through the stratum corneum, restricting transdermal absorption.
- Risk of hypersensitivity or allergic reactions associated with topical administration.
- Suitable primarily for drugs requiring low systemic plasma concentrations to achieve therapeutic efficacy.
- Presence of epidermal enzymes may lead to drug degradation, reducing therapeutic effectiveness.
- Poor absorption of drugs with high molecular weight or larger particle size through the skin barrier.

Ideal Properties Of Gel⁽⁸⁾⁽⁹⁾

1. The gel should possess a uniform consistency and exhibit optical clarity.

Uses Of Gel⁽⁷⁾

1. As delivery systems for topical drugs are applied directly to the skin surface, mucous membranes, or ocular surfaces.
2. As long-acting drug delivery systems when administered intramuscularly or implanted subcutaneously.
3. As multifunctional excipients in formulations—serving as binders in tablet granulation, protective colloids in suspensions, thickeners in oral liquids, and bases for suppositories.
4. In cosmetic formulations, including shampoos, fragrance products, dentifrices, and various skin and hair care preparations.
5. As lubricants for medical devices such as catheters.
6. As inert bases for dermatological patch testing.
7. In the form of sodium chloride (NaCl) gel for electrocardiography procedures.
8. As sodium fluoride or phosphoric acid gels for dental prophylactic treatments

Phytochemical Screening⁽¹⁰⁾

1. **Detection of Alkaloids:**



The extracts were individually dissolved in dilute hydrochloric acid and then filtered.

a) Wagner's Test:

The filtrates were treated with Wagner's reagent (a solution of iodine in potassium iodide). The formation of a brown or reddish precipitate indicates the presence of alkaloids.

b) Hager's Test: Filtrates were treated with Hager's reagent (saturated picric acid solution). Presence of alkaloids confirmed by the formation of yellow coloured precipitate.

2. Detection of Carbohydrates:

The extracts were individually dissolved in 5 mL of distilled water and then filtered. The resulting filtrates were used to test for the presence of carbohydrates.

a) Fehling's Test: The extract was treated with dilute hydrochloric acid, neutralized with an alkali, and then heated with Fehling's solution A and B. The formation of a red precipitate indicates the presence of reducing sugars.

3. Detection of glycosides

Extracts were hydrolysed with dil. HCl, and then subjected to test for glycosides.

a) Legal's Test: The extracts were treated with sodium nitroprusside in pyridine, followed by sodium hydroxide. The formation of a pink to blood-red color indicates the presence of cardiac glycosides.

4. Detection of saponins

a) Froth Test: The extracts were diluted with distilled water to a volume of 20 mL and shaken in a graduated cylinder for 15 minutes. The formation of a stable foam layer of approximately 1 cm indicates the presence of saponins.

5. Detection of phenols

a) Ferric Chloride Test: Extracts were treated with 3-4 drops of ferric chloride solution. Formation of bluish black colour indicates the presence of phenols.

6. Detection of flavonoids

a) Alkaline Reagent Test: The extracts were treated with a few drops of sodium hydroxide solution. The formation of an intense yellow color, which becomes colorless upon the addition of dilute acid, indicates the presence of flavonoids.

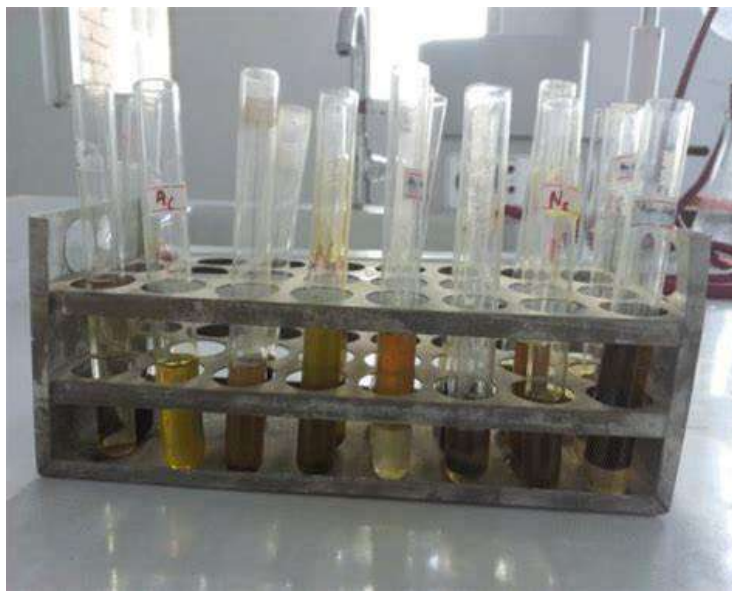
b) Lead acetate Test: The extracts were treated with a few drops of lead acetate solution. The formation of a yellow-colored precipitate indicates the presence of flavonoids.

7. Detection of proteins

a) Xanthoproteic Test: The extracts were treated with few drops of conc. Nitric acid. Formation of yellow colour indicates the presence of proteins.

8. Detection of diterpenes

a) Copper acetate Test: The extracts were dissolved in water and treated with 3-4 drops of copper acetate solution. Formation of emerald green colour indicates the presence of diterpenes.



Evaluation Of Polyherbal Gel ⁽⁹⁾

1. pH Determination:

The pH of each individual and polyherbal gel formulation was determined using a calibrated pH meter.

2. Appearance and Homogeneity:

The physical appearance and homogeneity of the individual and polyherbal gels were evaluated through visual inspection.

3. Viscosity Measurement:

Viscosity was measured using a Brookfield viscometer (Model RVTDV II) equipped with spindle number six, operating at 100 rpm, for both individual and polyherbal gel formulations.

4. Spreadability:

Spreadability was assessed by measuring the spreading diameter of 1 gram of gel placed between two horizontal glass plates (20 cm × 20 cm) after one minute.

5. Skin Irritation Studies:

Wistar rats (150–200 g, both sexes) were used for dermal irritation studies. The hair on the dorsal side of each rat was removed three days prior to the experiment. The test formulations (gels containing herbal extracts) were applied to intact skin, while a control group received only the gel base. Treatments were administered daily for seven days. The application sites were visually examined for signs of erythema and edema.

6. Extrudability:

Gels were filled into standard collapsible aluminium tubes, sealed by crimping, and weighed. The tubes were then positioned between two glass slides. After removing the cap and placing 0.5 g of weight on the upper slide, the extruded gel was collected and weighed. Extrudability was calculated as a percentage, and the results were classified as follows:

- 90%: Excellent
- 80%: Good
- 70%: Fair

7. Primary Dermal Irritation Index (PDII):

Dermal irritation is defined as reversible skin damage induced by the application of a substance, typically assessed over a maximum duration of four hours. The Primary Dermal Irritation Index (PDII) was determined to classify the topical gel formulations in terms of their acute dermal toxicity following a single application. Observations were systematically recorded at 12, 16, 24, 48, and 72 hours post-application. The resulting PDII score was then employed to categorize the formulation as either irritating or non-irritating.

CONCLUSION

The study demonstrates that the gel formulation containing herbal isolates exhibits strong antimicrobial and anti-inflammatory activities, along with favorable physical properties. It is designed for topical application and has shown effectiveness in eliminating microbes, making it suitable for the treatment of skin infections. Additionally, it supports wound healing and is safe for use.

REFERENCES

1. Baitule AW, Tawar MG, Pande SD. Formulation and Evaluation of Polyherbal Gel. *Res J Pharm Technol.* 2023;16(4):2013–6.
2. Misal G, Dixit G, Gulkari V. Formulation and evaluation of herbal gel. *Indian J Nat Prod Resour.* 2012;3(4):501–5.
3. Bhargavi Posinasetty, Chandaka Madhu, Upendra Chandrakant Galgatte, Srividya Kommineni, Basavaraj H, B. Appa Rao, et al. Design and Evaluation of Polyherbal Nanogel for The Treatment of Rheumatoid Arthritis. *J Adv Zool.* 2023;44(S-5):1150–9.
4. R JM, S SN, B KW, B AA. Solid Lipid Nanoparticles: A Novel Approach for Fungal Therapy. 2025;3(4):1902–12.
5. Salunkhe KS. R a p s. 2013;3(2).
6. Jain A, Ambule A, Choudhari N, Rahangdale S, Upparwar R, Bisen R. Formulation and Evaluation of Polyherbal Gel With Antifungal Properties. 2023;11(7):2320–882. Available from: www.ijcrt.org
7. Metta S, Amir KM, Lakshmi MS, Devi P, Shruthi K. A review: pharmaceutical gels and its types with prominence role of its drug delivery systems. *Int J Res Anal Rev [Internet].* 2023;10(2):686–701. Available from: www.ijrar.org
8. Sharma MU, Arjariya S, Chouksey R, Sharma N. A review: formulation and evaluation of pharmaceutical gel. *J Pharm Negat Results .* 2022;13(1):1344–62.
9. Smruti S, Soham S, Vaishnavi S, Pragati S. A Review On Multipurpose Therapeutic Use Of Herbal Gel. 2023;1(12):557–66.
10. Dhakar R, Chouksey K, Ganju K. Formulation of Polyherbal Formulation for Treatment of Topical Infection and Alopecia. *Asian J Pharm Educ Res.* 2021;10(2):27–38.
11. - SBJ, - SSJ, - SAJ, - TMJ, - VSJ, - MPSK. Formulation and Evaluation of Polyherbal Gel for Management of Mouth Ulcer. *Int J Multidiscip Res.* 2024;6(4):764–8.

HOW TO CITE: Aakif Hashmi, Dr. Shivappa N. Nagoba*, Atiya Shaikh, Akhilesh Limaye, Shripal Kolsure Harshada Ghuge, Review On: Anti-inflammatory Polyherbal Gel for Bacterial Skin Infections, *Int. J. of Pharm. Sci.*, 2025, Vol 3, Issue 5, 4696-4704. <https://doi.org/10.5281/zenodo.15543055>

