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Research Article

Formulation and Evaluation of Herbal Anti-Fungal & Anti-Acne Soap

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ABSTRACT

This investigation focused on the preparation and evaluation of herbal transdermal patches containing *Elephantopus scaber* root extract for wound healing purposes. The authenticated roots were carefully dried, powdered, and subjected to ethanol extraction using the cold maceration technique. The obtained extract was incorporated into a polymeric matrix composed of HPMC, methylcellulose, glycerin, and propylene glycol to formulate the patches. The formulated patch was evaluated for thickness, weight uniformity, folding endurance, moisture content, stability study, PH, In-vitro drug release, & Skin irritancy. The formulated patch was thin, flexible, and uniform with smooth surface. Average thickness was found to be 0.23mm and weight uniformity was 0.163g. The folding endurance for formulated patches was about 150, confirming good flexibility. Surface PH was found to be 6.1 which was compatible with skin. Moisture content was exhibited as 3.3% suggesting adequate hydration without microbial risk on surface. Stability studies conducted at 25°C for 30 days showed no significance change in drug content, physical appearance, ph. In vitro drug release using Franz diffusion cell showed sustained release of deoxyelephantopic with 85.9 % cumulative release in 24hr. Skin irritation test for 24 h patch test on human volunteers showed irritation index of 0.0 classifying the patch as non-irritant.

Keywords: Herbal transdermal patches, *Elephantopus scaber*, deoxyelephantopic, Flavonoids, Wound healing, Safe, Effective.

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INTRODUCTION:

For centuries, herbal plants have served as the foundation of traditional medicine and Natural healing. They contain a variety of bioactive compounds such as alkaloids, flavonoids, terpenes, and Phenolic acids that provide their medicinal benefits. Throughout history, systems like Ayurveda, Traditional Chinese Medicine, and Indigenous practices have utilized these plants to cure diseases, boost Immunity, and improve general well-being. Medicinal plants are essential to both ancient and modern Healthcare because of their powerful healing compounds. A prime example is *Elephantopus scaber*, which Contains deoxyelephantopic and is highly valued in Ayurvedic and traditional medicine for its therapeutic Benefits.

Elephantopus Scaber

Using *Elephantopus scaber* roots in herbal patches is a big step forward in Mixing ancient healing with modern technology. These roots contain a powerful natural

compound called Deoxyelephantopic, which helps wounds close faster by boosting skin repair and collagen growth. By Putting these extracts into a patch, the medicine is released slowly and steadily right where it's needed, Keeping the wound clean and moist while avoiding the stomach. This method uses the plant's natural Ability to fight against infection.

Introduction to wounds:

- Acute Wounds:** These are wounds that heal in a normal, predictable manner, such as cuts, abrasions, Or surgical incisions.
- Chronic Wounds:** These are wounds that do not heal as expected and persist for a long period. Examples include diabetic ulcers, pressure ulcers, and venous ulcers.

General Structure of Wound

A wound is simply a break in the skin surface, extending to the middle and deep layers, including the fatty tissue. When

you get hurt, your body creates a “wound bed” and tries to fill it with granulation tissue, which is the bumpy, red new skin full of blood vessels. Healing usually starts at the edges, where new skin cells crawl toward the centre to close the gap. Depending on how bad the injury is, you might see fluid (which carries germ-fighting cells) or a scab that acts like a natural shield to protect the new skin growing underneath.

Transdermal Drug Delivery System:

Transdermal drug delivery systems (TDDS), commonly known as patches, are advanced dosage forms designed to

administer a therapeutically effective quantity of medication across a patient's skin. This sophisticated method systemically delivers active agents by applying a specialized drug formulation directly onto intact, healthy skin. Upon application, the medication penetrates the outermost stratum corneum and migrates through the deeper epidermis and dermis layers without causing localized drug accumulation. Once these therapeutic compounds reach the dermal layer, they are rapidly absorbed into the systemic bloodstream via the skin's microcirculation networks to initiate healing.

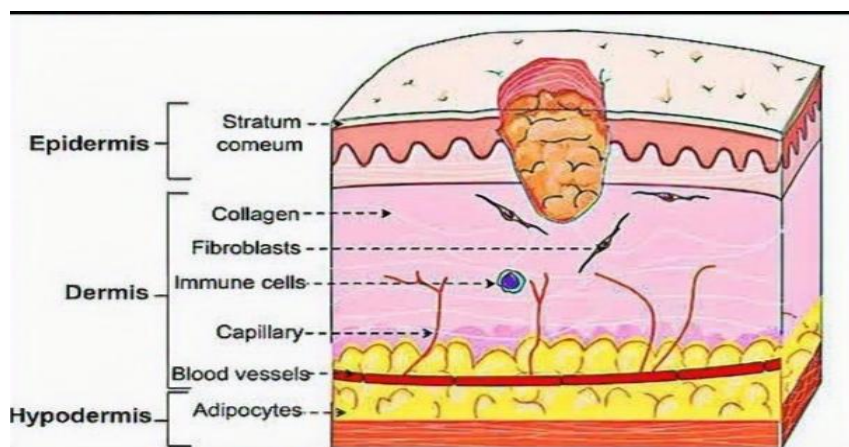


Figure 1: General Structure of Wound

Mechanism of skin permeation:

Transdermal patches enhance tissue repair by using a concentration gradient to push therapeutic molecules directly through the skin's protective outer layer, the stratum corneum. Once applied, the active compounds exit the patch matrix and migrate through the deeper epidermal and dermal layers by navigating around or through skin cells. By targeting the injury site directly, this localized delivery system continuously supplies healing agents to stimulate cellular growth and collagen production. This targeted approach maintains a moist, clean microenvironment at the wound bed to accelerate regeneration while completely bypassing the digestive tract.

Need of the Study:

This research focuses on developing a non-invasive, sustained-release transdermal delivery system that enhances the therapeutic value of traditional medicinal plants through advanced formulation techniques. *Elephantopus scaber* root contains the deoxyelephantopin, lupeol, as a main chemical constituent which are responsible for wound healing & anti-inflammatory activity. By utilizing transdermal patch technology, this approach seeks to offer targeted topical or systemic relief through a synergistic herbal blend while significantly improving patient compliance and convenience. Furthermore, delivering active botanical compounds directly through the skin avoids the gastrointestinal tract and first-pass metabolism, thereby reducing the side effects typically linked to oral medication.

Materials and Methods:

Elephantopus scaber roots, Ethanol, water, filter paper, Water bath, Measuring cylinder, conical flask, beaker, etc.

Elephantopus scaber roots Authentication and collection:

The roots of *Elephantopus scaber* L. (Family: Asteraceae) were collected from farms in Dhanore during 15/04/2026. The botanical identity of the plant material was examined and officially authenticated from the pharmacognosy department. The harvested root materials were carefully separated, washed thoroughly with running tap water to remove soil particles, and shade-dried at room temperature. The completely dried roots were subsequently pulverized into a coarse powder using a mechanical grinder and stored in an airtight container for further extraction procedures.

Method of extraction

The extraction was performed via cold maceration by soaking the pulverized root powder in 90–95% ethanol at a weight-to-volume ratio between 1:3 and 1:5. This mixture was kept in a sealed container at room temperature for 3 to 7 days and shaken occasionally to promote optimal compound diffusion. Following this incubation period, the liquid extract was separated from the insoluble plant debris by filtering it through Whatman No. 1 filter paper to obtain a clear filtrate. To maintain the stability of the bioactive compounds and prevent light-induced degradation, the final concentrated extract was transferred into airtight amber

glass bottles and stored in a cool, dark, and clean environment.

Preliminary phytochemicals screening test

1. Flavonoids Test

a) Alkaline Reagent test

Add 2ml of extract; add few drops of 10% NaOH solution. A yellow color appears which Disappears after Adding dil. HCL, that indicating presence of the Flavonoids.

b) Shinoda test

2ml extract, add small piece of magnesium, with a few drops of conc HCL. Pink or Orange color appears that indicates presence of flavonoids.

c) Lead acetate test

Add a few drops of 10% lead acetate solution to 2ml of extract. Formation of a yellow color indicates Presence of Flavonoids.

2. Alkaloids:

a) Mayer's test

Add few drops of Mayer's reagent into plant extract. Formation of white or creamy Precipitation indicates Presence of alkaloids.

b) Wagner's test

Add Wagner's reagent into plant extract. A reddish-brown precipitation forms if alkaloids are Present.

c) Dragendroff's test

Dragendroff's reagent into plant extract. An orange or brown precipitate confirms Alkaloids.

3. Tannins:

Ferric Chloride test

Add few drops of 1% of FeCl₃ solution to 4ml of plant extract. Blue or green black color Denoting Presence of tannins.

4. Saponins:

Foam test

Shake 1ml of extract with 10ml of distilled water in a test tube vigorously for 30 seconds. Persistant foam that Last for 10 min indicates presence of saponin.

Method of Preparation of Patch

Prepare Polymer Solution: HPMC was dissolved in ethanol. Glycerin was added for Inflexibility.

Incorporate Drug Extract: *Elephantous Scaber* root extract was mixed into the polymer solution for the required Dosage.

Cast the Patch: Pour the solution onto a flat surface to form a steady film.

Dematerialize Solvent: Allow the solvent to dematerialize, forming a solid patch structure.

Dry and Cure: Remove residual moisture and freely cure the patches for bettered properties.

Cut and Package: Cut patches to desired size pack and store in cool temperature in dark.

Table 1: Formulation of transdermal patches:

Sr.no	Name of Ingredients	Qty	Role
1)	<i>Elephantous Scaber</i>	50 mg	Active herbal ingredient
2)	HPMC	300 mg	Film forming layer
3)	Methyl cellulose	45 mg	Thickening agent
4)	Glycerine	5ml	Plasticizer
5)	Propylene Glycol	10 ml	Permeations enhancer
6)	Menthol	25mg	Soothing agent
7)	Ethanol	q.s	Solvent
8)	Water	q.s	Solvent

Evaluation of Transdermal Patch:

1. Physical characteristics

Visual Inspection of patches to check uniformity in size, shape, color, surface Smoothness and Transparency.

2. Thickness Measurement

Measure the thickness of each patch using a micrometre / ruler. Ensure the thickness falls Within a specified Range (e.g. 0.2 – 0.3 mm) (24).

3. Folding Endurance

Repeatedly folding of the patch is indicates how patch is flexible.

4. PH Testing

Moisten a piece of PH paper with distilled water and press it against the adhesive side for 1 Minute, then observe the color change. The pH should be close to skin's natural pH. (4.5-6.5).

5. Moisture content

A known weight of each freshly prepared patch was taken C recorder as initial weight (w₁). The patches were Then Placed in a clean and dry petri dish and transferred to a Hot air oven maintained at 600 C. The patches Were dried in the oven for 1 hr. After Drying period, the patches were removed from the oven, allowed to Cool in a Desiccator, then Weighed again and recorded as final weight (w₂) (26). Percentage moisture content was calculated

using the Formula: Moisture Content (%) = $(W1 - W2)/W1 \times 100$

6. Stability testing

To see if patches last, keep them in a warm machine for six months. Take samples out after one, three, and six months. Test these samples in a lab to check three things: if they still stick, if the medicine is still strong, and if the drug releases at the correct speed. The temperature & humidity should be maintained at $25 \pm 2^\circ\text{C}$ & $60 \pm 5\%$ RH respectively.

7. Skin irritation test

The skin irritation potential of the formulated patch was evaluated using the single 24h patch test on healthy human volunteers, adapted from OECD guidelines and standard dermatological practice. The study protocol was approved by institutional ethics committee.

8. Weight uniformity

The prepared herbal transdermal patches were cut into equal sizes and individually weighed Using a digital balance. The weight of each patch was recorded, and the average weight along with

variation was calculated to determine weight uniformity among the patches.

9. Moisture uptake

Moisture uptake of the patches was studied with the help of a climate chamber. The Patches were kept in the chamber at room temperature and 80% humidity for 48 h. The Initial weights of the patches were previously weighed, and after 48 h they were weighed Again Moisture uptake was calculated based on the weight increase and expressed as A percentage according to the following equation:

Moisture uptake =

Final weight – Initial weight / Initial weight $\times 100$

10. In - vitro drug release

The herbal Transdermal patch was placed in a Franz diffusion cell using a dialysis membrane. The receptor compartment was filled with phosphate buffer (pH 7.4) and maintained at $37 \pm 0.5^\circ\text{C}$ with continuous stirring. Samples were withdrawn at predetermined intervals and analyzed using UV–Visible spectrophotometry to determine drug release.

Result and Discussion

Evaluation of phytochemical screening test

Sr.No	Test	Result
1.	Flavonoids a) Alkaline reagent test b) Shinoda test c) Lead acetate test	Present Present Present
2.	Alkaloids a) Mayers test b) Wagners test c) Dagendroff test	Present Present Present
3.	Tannins a) Ferric chloride test	Present
4.	Saponins a) Foam test	Present

Evaluation of transdermal patch

Physical appearance

- Colour: Pale whitish appearance.
- Smoothness: Smooth
- Transparency: Slightly translucent
- Flexibility: Flexible
- Presence of air bubbles: Free from air bubbles
- Cracks or imperfections: Free from cracks and perfect
- Uniformity of surface: Uniform surface.

Thickness Measurement

The Thickness of Formulated transdermal patches were evaluated to be 0.23mm using Vernier Calliper

Folding Endurance

The prepared transdermal patch showed good flexibility and withstood repeated folding Without breaking. Folding endurance was found to be approximately 120–

150 folds, indicating good mechanical Strength and flexibility of the patch.

Surface PH Determination:

The PH of Formulated herbal Transdermal Patches Was found to be in 6.1

Moisture content

Initial weight 0.165gm and Final weight 0.160gm so By Using the formula of NMC

$5\% \text{ Moisture content } (0.165 - 0.160) / 0.165 \times 100 = 3.03\%$

Hence, the Moisture Content was evaluated to be 3.03%

Stability Study:

No significant changes in colour, texture, flexibility, or surface appearance were observed During storage.

Table 2: Stability study of Transdermal Patches

Parameter	Initial	After 30 days
Colour	Pale white	No change
Ph	6.0	6.2
Flexibility	Flexible	Flexible
Drug content	96%	95%
Appearance	Smooth	No change

❖ Stability Conditions

- Temperature: $25 \pm 2^\circ\text{C}$
- Relative Humidity: $60 \pm 5\%$ RH
- Study Duration: 30Days.

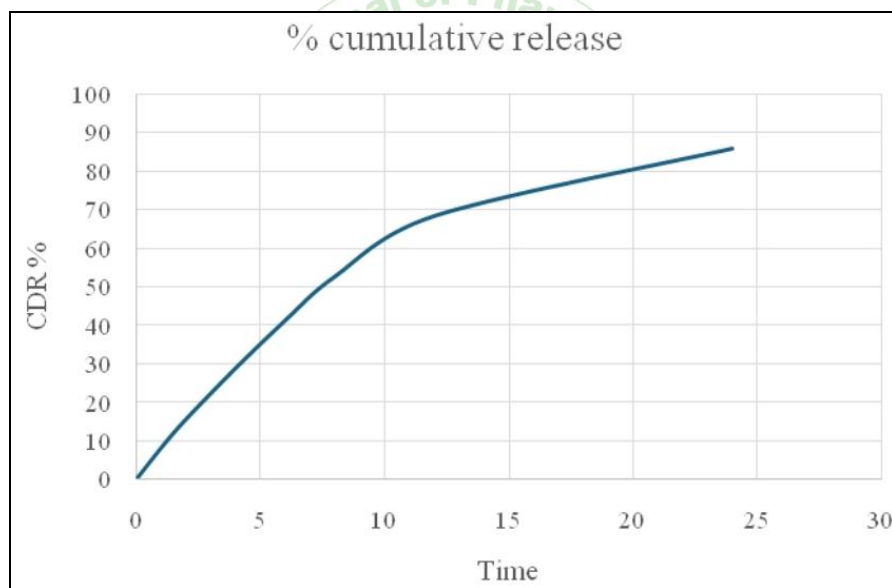
The prepared formulation was found to be stable under room temperature storage conditions.

Skin irritation test

The transdermal patches did not produce any irritation, and no allergic conditions were observed.

In-Vitro Drug Release

Deoxyelephantopin from *E.Scaber* transdermal patch in phosphate buffer PH 7.4 at $32 \pm 0.5^\circ\text{C}$. Data = mean $\pm$ SD, n=3. Patch showed sustained release of $85.9 \pm 2.1\%$ over 24h.

**Graph: 1** In-Vitro Drug Release Profile of Herbal Transdermal Patches**CONCLUSION**

In conclusion, a stable and effective herbal transdermal patch containing *Elephantopus scaber* root extract was successfully formulated using a biocompatible polymeric matrix of HPMC and methylcellulose. The developed patches exhibited satisfactory physicochemical and mechanical properties, demonstrating excellent uniformity in weight optimized thickness low moisture properties, and robust tensile strength capable of regular handling without tearing. Phytochemical evaluation confirmed the successful retention of key bioactive constituents responsible for tissue regeneration.

Weight Uniformity:**Table 3:** Weight Uniformity

Sr.no	Individual weight	Avg.weight
1)	0.160g	0.163g
2)	0.163g	
3)	0.166g	

Hence, the average weight of transdermal patches was found to be **0.163 g**.

Moisture uptake

Initial weight 0.163gm and Final weight-0.169gm

So, by using the formula of MU: -

$$\% \text{ Moisture Uptake} = \frac{(\text{final weight} - \text{initial weight})}{\text{initial weight}} \times 100$$

$$(0.169 - 0.163) / 0.163 \times 100 = 3.68\%$$

$$\text{Percentage Moisture Uptake} = 3.68\%$$

Crucially, in-vitro profiling revealed a highly desirable sustained-release pattern, achieving a cumulative drug release of 92% over 9 hours, ensuring a prolonged therapeutic effect at the wound site. Biocompatibility and safety were validated by the complete absence of skin irritation or allergic reactions during localized application. Furthermore, stability testing under standard ICH conditions for 30 days confirmed that the patches maintain their physical integrity, pH stability, and high drug content retention. Overall, these findings indicate that the formulated *Elephantopus scaber* transdermal patch represents a safe, stable, and highly promising controlled-delivery system for enhanced wound healing applications.

Clinical Significance & Future Scope

The formulated *Elephantopus scaber* transdermal patch bridges the therapeutic gap between immediate localized pain relief and long-term maintenance by utilizing an innovative single-layer matrix design that bypasses hepatic first-pass metabolism and eliminates the burden of multiple oral dosing. By combining rapid localized cooling with continuous, sustained anti-inflammatory drug delivery, this platform enhances patient compliance while providing stable tissue-regeneration properties and robust mechanical protection at the wound site without causing skin irritation. Crucially, the patch maintains complete physical and chemical stability under standard ICH conditions, validating its safety and performance profile for predictable clinical outcomes. Future translation will focus on in-vivo pharmacokinetics to map systemic plasma concentrations, human cadaver skin ex-vivo permeation modeling, and long-term accelerated stability assessments to fully qualify its clinical utility.

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