A Review on Therapeutic Potential and Transdermal Application of Picrorhiza Kurroa For The Treatment of Psoriasis

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Abstract

Psoriasis is a chronic, immune-mediated inflammatory skin disease characterized by excessive keratinocyte proliferation, erythema, and scaling, significantly affecting patients' quality of life. Conventional therapies such as corticosteroids, immunosuppressants, phototherapy, and biologics provide symptomatic relief but are often associated with relapse, systemic toxicity, high cost, and poor patient compliance. Picrorhiza kurroa (commonly referred to as Picrolizacura) is a traditional Ayurvedic medicinal herb known for its potent anti-inflammatory, antioxidant, immunomodulatory, and hepatoprotective properties. Its major bioactive constituents, including picroside I, picroside II, kutkoside, and apocynin, have demonstrated promising activity in modulating inflammatory pathways, reducing oxidative stress, and regulating immune responses involved in psoriasis pathogenesis. Transdermal drug delivery of Picrorhiza kurroa offers additional therapeutic advantages such as localized targeted action, sustained drug release, minimal systemic exposure, improved safety profile, and enhanced patient adherence. This review critically discusses the phytochemistry, pharmacological profile, mechanism of action, and therapeutic relevance of Picrorhiza kurroa in psoriasis, along with the potential of its transdermal applications including patches, gels, and films. Further preclinical and clinical investigations are essential to establish standardized formulations, safety validation, and clinical efficacy for future therapeutic use.

Keywords: Psoriasis, Picrorhiza kurroa, Picrolizacura, Herbal medicine, Anti-inflammatory, Immunomodulatory, Antioxidant, Transdermal drug delivery, Herbal transdermal patch,V Phytotherapy.

Introduction

Transdermal Application

Transdermal application refers to delivering a drug or therapeutic agent through the skin so that it enters the systemic bloodstream and produces a therapeutic effect.

Instead of taking a medicine by mouth or injection, the drug is placed on the skin surface in the form of a patch, gel, ointment, lotion, or cream, where it slowly passes through the skin layers and reaches the blood.

How It Works

1.Drug is applied to the skin surface.

2.It penetrates the stratum corneum (outer skin layer).

3.It moves through deeper layers of the skin (epidermis → dermis).

4.It enters the capillaries and reaches the bloodstream.

5.The drug gives a controlled, sustained effect over many hours or days.

Advantages of Transdermal Application

1.Avoids stomach irritation and first-pass liver metabolism

2.Provides controlled, steady release of the drug.

3.Painless and easy to apply.

4.Improves patient compliance.

5.Suitable for drugs needing long-term therapy.

Disadvantage of Transdermal Application

1.Only suitable for drugs that can pass through skin.

2.Skin irritation or allergic reactions may occur.

3.Limited drug dose can be delivered.

Psoriasis

Psoriasis is a chronic, inflammatory skin disorder characterized by rapid proliferation of keratinocytes, leading to thick, scaly, and itchy skin lesions. Although several topical and systemic therapies are available, many of them are associated with limitations such as poor skin penetration, systemic side effects, and the need for long-term administration. This has increased interest in herbal medicines and novel drug- delivery systems that offer safer and more effective treatment options.

Picrorhiza kurroa, a well-known medicinal plant in Ayurveda, has gained significant attention due to its strong anti-inflammatory, antioxidant, immunomodulatory, and hepatoprotective activities. Its major bioactive compounds—picroside I, picroside II, kutkoside, and apocynin—are reported to modulate inflammatory pathways involved in psoriasis, such as excessive immune activation and oxidative stress.

However, oral or topical use of herbal extracts often faces challenges like poor stability, limited skin permeation, and variable bioavailability. To overcome these issues, the development of a transdermal patch containing Picrorhiza kurroa offers a promising alternative. Transdermal drug delivery provides controlled and sustained release of the active constituents directly to the affected skin layers, improves therapeutic outcomes, reduces dosing frequency, and minimizes systemic side effects.

Therefore, preparing a transdermal patch from Picrorhiza kurroa for the treatment of psoriasis combines the benefits of herbal therapy with an advanced delivery system. This approach has the potential to enhance patient compliance, ensure targeted drug delivery, and provide a safer.

1.Psoriasis is a chronic, non-contagious skin disease that causes red,scalpy patches on the skin.

2.It occurs due to an overactive immune system that speeds up the growth of skin cells.

3.Commonly affects areas like the elbows,knees,scalp and lower back.

4.The disease cannot be completely cured but can be managed with proper treatment and care.

5.It also affects a person's confidence and quality of life,making awareness important.

Symptoms of Psoriasis

- Red patches on skin
- Dry, cracked skin that may bleed.
- .Itching, burning or soreness.
- Thickened, pitted, or ridged nails.
- Stiff, swollen joints(in some types of psoriasis)
- Small scaling spots(common in children with psoriasis)
- Discoloration or inflammation in the affected areas.

Types of Psoriasis

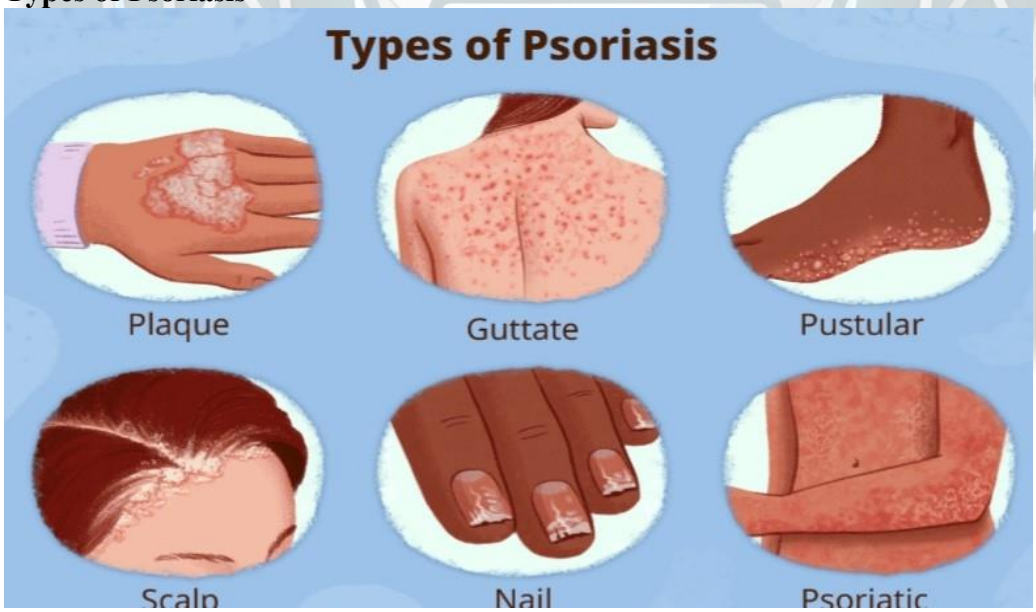


Fig No.-1

1.Plaque Psoriasis (Most common)

Makes red, raised patches covered with silvery-white scales.

Usually appears on elbows, knees, scalp, and lower back.

2.Guttate Psoriasis

Small, drop-shaped red spots.

Common after throat infections (streptococcal) .

Seen more in children n and young adults.

3.Pustular Psoriasis

White pus-filled blisters surrounded by red skin.

Can be localized (hands/feet) or widespread.

4.Nail Psoriasis

Affects fingernails/toenails.

Causes pitting, thickening, discoloration, nail separation.

5.Scalp Psoriasis

Red patches with scales on the scalp, itching and hair.

6.Psoriatic Arthritis

Joint inflammation with psoriasis.

Causes swelling, stiffness, joint pain.

PICRORHIZA

The botanical name for Picrorhiza kurroa is Picrorhiza kurroa (sometimes cited as Picrorhiza kurroa Royle ex Benth.) It is widely used in Ayurvedic medicine for treating a variety of aliments , particularly liver and gallbladder disorders such as jaundice , hepatitis and fatty liver disease. It also possesses anti-inflammatory, anti- diabetic, anti-asthmatic and immune-modulatory properties and is used for fevers,indigestion and chronic coughs.

PHARMACOLOGICAL PROPETIES OF PICRORHIZA KU

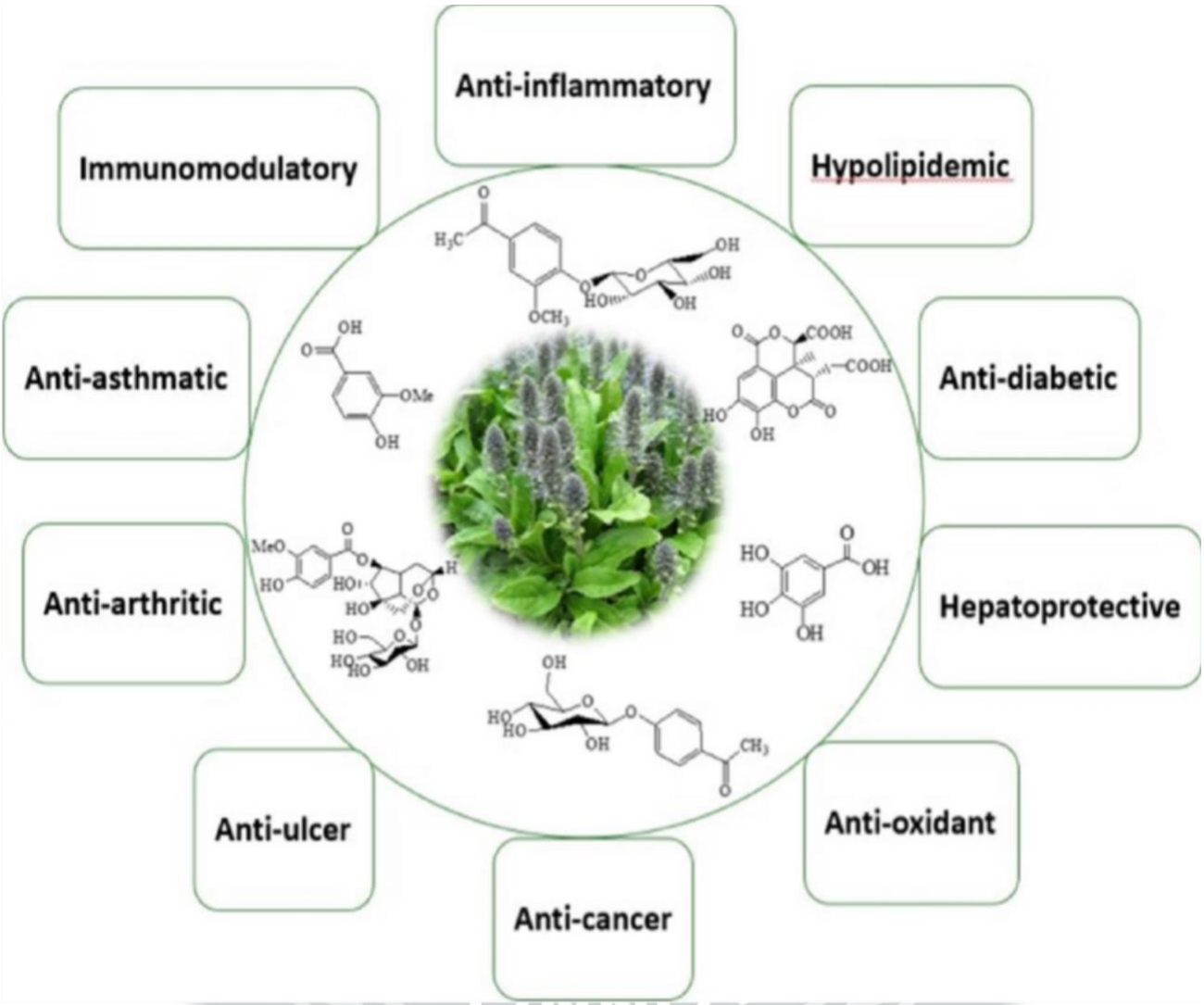


Fig No.-2

Chemical constituents present in Picrorhiza kurroa

Major Active Compounds

1. Picroside I

2. Picroside II

3. Kutkoside
4. Apocynin
5. Vanillic acid
6. Androsin

Other Phytochemicals

1. Cucurbitacins
2. D-mannitol
3. Kutkin (a mixture of picroside I and kutkoside — main active principle)
4. Iridoid glycosides
5. Phenolic compounds
6. Flavonoid
7. Sterols

Pharmacological Importance

1. Picroside I & II → anti-inflammatory, hepatoprotective, antioxidant (helpful in psoriasis).
2. Apocynin → inhibits oxidative stress and inflammation.
3. Kutkoside → supports liver detoxification and skin protection.

NEED OF STUDY

1. To assess the therapeutic potential of Picrorrhiza kurroa in managing psoriasis.

2. To explore its anti-inflammatory and immunomodulatory effects for psoriasis treatment.

3. To evaluate the benefits of transdermal delivery for targeted skin therapy.

4. To review existing evidence on Picrorrhiza-based topical formulations.

5. To identify gaps in research on its transdermal application for psoriasis.

6. To determine whether it can offer a safer alternative to current psoriasis treatment.

Extraction of Picrorhiza Kurroa

1. Sample preparation

.Dry to constant weight; grind and sieve (40–60 mesh). Record dry weight.

2. Extraction solvent & ratio

Use 70% ethanol (v/v).

Typical ratio: 1:10 w/v (1 g powder : 10 mL solvent). e.g., 50 g : 500 mL**.**

3. Ultrasound-assisted extraction (recommended)

Place powder + solvent in flask; sonicate in ultrasonic bath or probe.

Conditions (starting point): 30–40°C, 30–45 minutes (probe: use pulses, 30 s on/30 s off).

If no ultrasound, use maceration 24–48 hr at room temp with occasional shaking.

4. Filtration & repeat

Filter (Whatman) and collect filtrate. Repeat extraction 1–2 more times with fresh solvent to exhaustively extract glycosides. Combine filtrates**.**

5. Concentrate

Remove ethanol under reduced pressure (rotavap) at ≤40°C to avoid degradation. Concentrate to an aqueous residue (small volume**).**

6. Liquid–liquid partitioning (enrichment step)

Transfer aqueous concentrate to separatory funnel.

Wash with n-hexane (2 ×) to remove nonpolar lipids/waxes — discard hexane layers.

Extract aqueous layer with ethyl acetate (optional) to remove medium polarity phenolics (may or may not contain picrosides).

Finally extract aqueous phase with n-butanol (3 ×). Picroside-I mostly partitions into n-butanol (polar glycoside fraction). Combine n-butanol extracts.

7.Dry & concentrate butanol fraction

Dry combined n-butanol over anhydrous sodium sulfate (if needed), filter, evaporate solvent under reduced pressure at ≤40°C. This yields a crude polar glycoside fraction (enriched in picrosides).

*** Evaluation Test for Transdermal Patch**

1. Appearance – Check color, smoothness, uniformity.
2. Thickness – Measure at multiple points using micrometer.
3. Weight Variation – Weigh each patch; ensure uniformity.
4. Folding Endurance – Check flexibility by repeated folding.
5. Tensile Strength – Measure strength and elasticity of patch.
6. Surface pH – Ensure patch surface pH is skin-friendly.
7. Moisture Content / Uptake – Determine stability against humidity.
8. Drug Content Uniformity – Measure drug amount in each patch.
9. In-vitro Drug Release – Check release profile of drug from patch
10. In-vitro Permeation (Franz Cell) – Determine drug permeation through skin.

11. Adhesion Tests – Tack test, peel strength, shear adhesion.

12. Skin Irritation Test – Ensure patch does not irritate skin.

13. Stability Studies – Check physical, chemical, and adhesive stability over time.

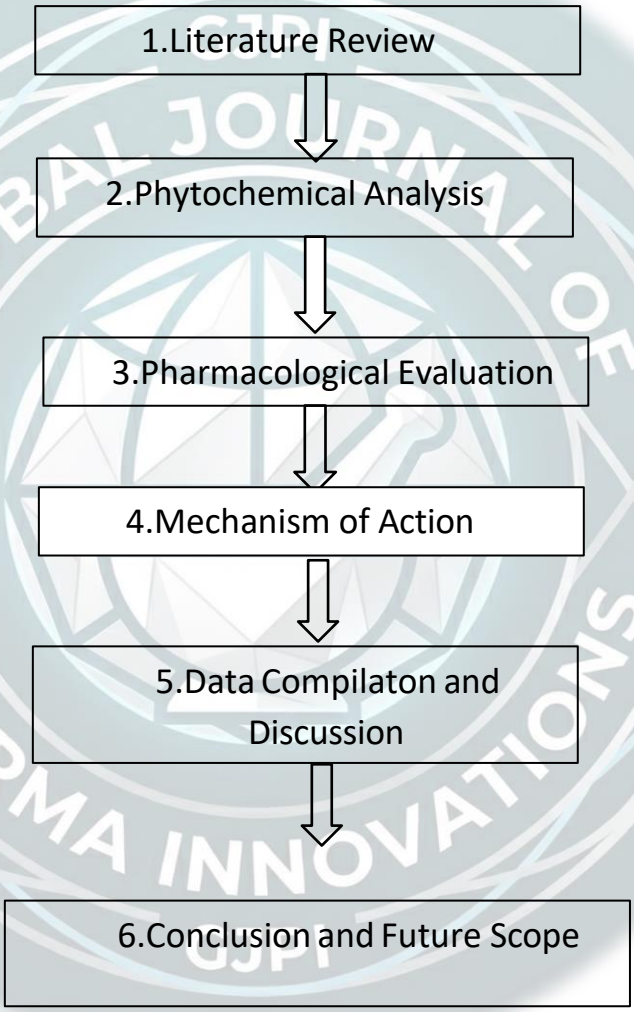
14. Packaging Integrity Test – Ensure packaging protects the patch.

Formulation Table for Prepartion of transdermal patch from Picrorhiza Kurroa to treat Psoriasis

Ingredient	**Function**	**Remarks**
Picrorhiza kurroa extract	Active pharmaceutical ingredient	Anti-inflammatory and immunomodulatory
HPMC (Hydroxyl methylcellulose)	Film-forming polymer	Provides structural integrity
PVA (Polyvinyl alcohol)	Secondary polymer	Enhances film flexibility
PEG-400(Polyethylene glycol)	Plasticizer	Improves patch elasticity and smoothness
Glycerin	Humectant	Maintains moisture balance
DMSO(Dimethyl sulfoxide)	Penetration enhancer	Facilities drug permeation through skin
Ehanol(95%)	Solvent	Dissolves extract and polymers
Distilled water	Solvent	Used to adjust final volume
Backing membrane	Support layer	Non-reactive , occulusive layer
Release liner	Protective layer	Removed before application

Table No.-

PLAN OF WORK



Conclusion

Picrorhiza Kurroa shows great promise as a natural remedy for psoriasis as a natural remedy for psoriasis because of its anti-inflammatory, antioxidant and immune-modulating properties.

Using it in a transdermal form (like a patch or gel) can help deliver the medicine directly to the affected skin,improving its effectiveness and reducing side effects.

Overall,Picrorhiza kurroa could be a safe and useful herbal option for managing psoriasis, but more scientific studies and clinical trials are needed to confirm its full potential

Future scope (research & development)

1. Mechanistic and preclinical work

Define molecular mechanisms (anti-inflammatory, antioxidant, immunomodulatory) of major Picrorhiza constituents (picrosides, kutkin, cucurbitacins) specifically in psoriatic pathways (IL-17/IL-23, TNF-α,NF-κB). This fills a gap between ethnobotany and mechanism-driven dermatology.

2. Optimized topical/transdermal formulations

Develop and compare delivery platforms (hydrogels, patches, nanoemulsions, lipid nanoparticles, microemulsions, penetration enhancers) to improve skin permeation and local bioavailability while minimizing systemic exposure. Recent work on herbal nano- formulations for psoriasis supports this direction.

3. Safety, pharmacokinetics, and dermal toxicity

Systematic in vitro (skin models) and in vivo toxicity, skin irritation and sensitization studies for both extract and isolated actives; evaluate percutaneous absorption and possible enzyme interactions (CYP, P-gp) relevant to topical use.

4. Clinical trials

Phase I/II randomized trials for topical/transdermal Picrorhiza formulations to measure efficacy (PASI score, lesion reduction, itch), safety, and patient-reported outcomes versus standard topical therapies or placebo. Meta-analytic evidence suggests some herbal topicals can be effective—but specific RCTs for P. kurroa are needed.

5. Standardization & quality control

Develop validated assays for marker compounds (picroside I/II) and set specs for extract composition, stability, and batch-to-batch reproducibility — essential for regulatory acceptance and commercialization.

6. Sustainability & cultivation research

Domestication, agronomy, and propagation protocols to reduce wild harvesting pressure; breeding for high-yield chemotypes. Conservation biology must accompany commercialization because P. kurroa populations are vulnerable.

Economic importance

1. Market potential for safe topical alternatives

Psoriasis affects ~2–3% of the global population; demand exists for safer, steroid-sparing topical options. Commercialized, clinically validated Picrorhiza-based topical or transdermal products could capture a meaningful herbal-dermatology niche.

2. Value chain & rural income

Cultivation and value-addition (standardized extracts, patch manufacturing) can create income streams for Himalayan growers and rural supply chains—if sustainable cultivation replaces wild collection.

3. IP and spin-outs

Novel transdermal formulations, standardized extract methods, and clinical data can support patents and product licensing (example: recent institutional herbal cream developments). This attracts industry partnerships and technology transfer opportunities.

Social importance

1. Improved patient adherence and quality of life

Safer, non-steroidal topical options or patches that reduce side effects (skin atrophy, rebound) may
improve long-term adherence and life quality for chronic patients.

2. Cultural acceptability

In regions with strong herbal/AYUSH traditions, evidence-based Picrorhiza products may be more acceptable and increase healthcare engagement.

3. Public health impact

Accessible topical alternatives could reduce steroid misuse and associated adverse effects at the population level—especially where over-the-counter steroid creams are commonly misused.

4. Conservation ethics & community benefits

If commercial demand is paired with sustainable harvest/cultivation programs, communities that steward
the plant gain livelihoods and incentives for conservation—positive

social and environmental feedback.

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