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PREPARATION AND CHARACTERIZATION OF HERBAL GEL OF AERIAL PARTS OF *URARIA PICTA* FOR TREATMENT OF SKIN DISEASE

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KEYWORDS

Uraria picta; Herbal gel; Hydroalcoholic extract; Phytochemical screening; Flavonoids; Phenolics; Antimicrobial activity.

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Abstract

The present study aimed to prepare and evaluate a herbal gel containing hydroalcoholic extract of *Uraria picta*. The extract was obtained with a yield of 12.5% w/w and subjected to preliminary phytochemical screening, which revealed alkaloids, glycosides, flavonoids, phenols, proteins, carbohydrates, and diterpenes. The total phenolic and flavonoid contents were 0.58 and 0.96 mg/100 mg of dried extract, respectively. Six herbal gel formulations (HG1–HG6) were prepared and evaluated for their physical and pharmaceutical properties. HG5 was selected as the optimized formulation based on its satisfactory characteristics and drug-release profile. The optimized formulation showed 97.2 ± 0.3% drug release at 120 min. HG5 also exhibited concentration-dependent antimicrobial activity against *Bacillus subtilis*, *Klebsiella pneumoniae*, and *Candida albicans*, with maximum zones of inhibition of 12 ± 0.74, 10 ± 0, and 11.6 ± 0 mm, respectively, at 100 mg/ml. The findings suggest that *Uraria picta* herbal gel possesses promising antimicrobial potential and may be useful as a topical herbal formulation.

Introduction

Skin diseases are among the most common health problems affecting individuals worldwide and include a wide range of inflammatory, infectious, allergic, and degenerative conditions. Disorders such as acne, dermatitis, eczema, fungal infections, and other inflammatory skin conditions can significantly affect the physical and psychological well-being of affected individuals (Hay et al., 2014). Although conventional topical preparations are widely used for the management of skin disorders, prolonged use of certain synthetic agents may be associated with adverse effects such as irritation, dryness, hypersensitivity, and other local reactions. Consequently,

increasing attention has been directed toward the development of plant-based topical formulations that may provide therapeutic benefits with improved tolerability (Madawi et al., 2023).

Medicinal plants have been used traditionally for the management of various skin ailments because of their diverse bioactive constituents, including alkaloids, flavonoids, phenolic compounds, tannins, glycosides, terpenoids, and saponins (Hussein and El-Anssary, 2019). These phytoconstituents may exhibit antimicrobial, antioxidant, anti-inflammatory, and wound-healing properties, making medicinal plants valuable candidates for the development of herbal dermatological preparations. The incorporation of plant extracts into suitable topical dosage forms can facilitate their application to the affected site and may enhance patient acceptability and therapeutic effectiveness (Bittner Fialová et al., 2021).

Uraria picta is a medicinal plant belonging to the family Fabaceae and has been traditionally employed in various systems of herbal medicine. Different parts of the plant have been reported to contain biologically active phytoconstituents that may contribute to its pharmacological properties (Yadav et al., 2025). The aerial parts of *U. picta* are of particular interest as a potential source of phytochemicals with antioxidant, antimicrobial, and anti-inflammatory activities. However, systematic formulation and characterization of its aerial-part extract into a suitable topical gel for skin-related applications remains comparatively limited (Saxena et al., 2014).

Herbal gels offer several advantages as topical drug delivery systems, including ease of application, good spreadability, non-greasy characteristics, rapid drug release, and improved patient compliance. A gel formulation containing *U. picta* aerial-part extract may provide a convenient approach for delivering its bioactive constituents directly to the skin (Olayemi and David, 2023). Therefore, the present study was undertaken to prepare and characterize a herbal gel containing the hydroalcoholic extract of the aerial parts of *Uraria picta*. The prepared extract was subjected to preliminary phytochemical evaluation, and the formulated herbal gel was evaluated for physicochemical characteristics, including appearance, homogeneity, pH, viscosity, spreadability, extrudability, drug/extract content, and in-vitro performance. The study was aimed at exploring the potential of *U. picta* aerial parts as a plant-based topical preparation for the management of skin diseases.

Material and Methods

Material

The materials used in the study included *Uraria picta* extract, potassium mercuric iodide, iodine, potassium iodide, potassium bismuth iodide, picric acid, sodium nitroprusside, sodium hydroxide, pyridine, ferric chloride, gelatin, lead acetate, nitric acid, copper acetate, sodium chloride, methanol, ethanol, chloroform, Folin–Ciocalteu reagent, Fehling's solution, Carbopol 940, polyethylene glycol, methyl paraben, triethanolamine, and distilled water. The chemicals and reagents were procured from Thomas Baker, Loba Chemie Pvt. Ltd., S. D. Fine Chem. Ltd., Qualigens Fine Chemicals, and Central Drug House Ltd., New Delhi, India, and were of suitable analytical grade.

Methods

Selection and collection of plant materials

The plants have been selected on its availability and folk use of the plant. Every parts of the plant may contain active secondary metabolites. Aerial parts of *Uraria picta* were collected from ruler area of Bhopal (M.P.) in the month of December, 2025.

Extraction by maceration process

Extraction is an essential step in phytochemical processing

50 gram of shade dried aerial parts of *Uraria picta* were coarsely powdered and subjected to extraction. Defatted aerial parts of *Uraria picta* were exhaustively extracted with hydroalcoholic solvent (Ethanol: Aqueous; 75:25v/v) by maceration method. The extract was evaporated above their boiling points. Finally, the percentage yields were calculated of the dried extracts (Ansari, 2001; Mukherjee, 2007).

Determination of percentage yield

After extraction, yield of the plant extracts obtained were calculated in grams and then converted it into percentage. Following formula was adopted for determination of percentage yield of selected plant materials. The percentage yield of each extract was calculated by using following formula:

$$\textbf{Percentage Yield} = \frac{Weight\ of\ Extract}{Weight\ of\ Powder\ drug\ taken} x\ 100$$

Phytochemical screening

Medicinal plants are resources of traditional medicines and many of the modern medicines are produced indirectly from plants. Phytochemical constituents are of two type primary bioactive constituents (chlorophyll, proteins, amino acids, sugar

etc.) and secondary bioactive constituents include (alkaloids, terpenoids, phenols, flavonoids etc.). Phytochemical examinations were carried out for extracts as per the standard methods.

Quantitative estimation of bioactive compounds

Total phenolic content estimation

The total phenolic content of the extract was determined by the modified folin-ciocalteu method. 10 mg Gallic acid was dissolved in 10 ml methanol, various aliquots of 10-50µg/ml was prepared in methanol. 10 mg of dried extract was dissolved in 10 ml methanol and filter. Two ml (1mg/ml) of this extract was for the estimation of phenol. 2 ml of extract and each standard was mixed with 1 ml of folin-ciocalteu reagent (previously diluted with distilled water 1:10 v/v) and 1 ml (7.5g/l) of sodium carbonate. The mixture was vortexed for 15s and allowed to stand for 10min for colour development. The absorbance was measured at 765 nm using a spectrophotometer (Parkhe and Bharti, 2019).

Total flavonoids content estimation

Determination of total flavonoids content was based on aluminium chloride method. 10 mg quercetin was dissolved in 10 ml methanol, and various aliquots of 5-25µg/ml were prepared in methanol. 10 mg of dried extract was dissolved in 10 ml methanol and filter. Three ml (1mg/ml) of this extract was for the estimation of flavonoids. 1 ml of 2% $AlCl_3$ solution was added to 3 ml of extract or each standard and allowed to stand for 15min at room temperature; absorbance was measured at 420 nm (Parkhe and Bharti, 2019).

Formulation development of herbal gel

Measured quantity of methyl paraben, glycerin, polyethylene glycol and hydroalcoholic extract of aerial parts of *Uraria picta* were dissolved in about 35 ml of water in beaker and were stirred at high speed using mechanical stirrer. Then Carbopol 940 was added slowly to the beaker containing above liquid while stirring. Neutralized the solution by slowly adding triethanolamine solution with constant stirring until the gel is formed (Nand *et al.,* 2012).

Table 1: Formulation of herbal gel

Ingredients	HG1	HG 2	HG3	HG4	HG5	HG6
Uraria picta extract	1gm	1gm	1gm	1gm	1gm	1gm
Carbopol 940	0.25mg	0.5mg	0.75mg	1.0 gm	1.25 gm	1.5 gm

Polyethylene glycol	0.2ml	0.2ml	0.2ml	0.2ml	0.2ml	0.2ml
Methyl paraben	0.08mg	0.08mg	0.08mg	0.08mg	0.08mg	0.08mg
Triethanolamine	1.0ml	1.0ml	1.0ml	1.0ml	1.0ml	1.0ml
Distilled Water (q.s)	100ml	100ml	100ml	100ml	100ml	100ml

*HG = Herbal gel

Evaluation of herbal gel

Appearance and consistency

The physical appearance was visually checked for the texture of herbal gel formulations for color, odor and texture (Yamini and Onesimus, 2013).

Washability

Formulations were applied on the skin and then ease and extent of washing with water were checked manually and observed.

Extrudability determination of formulations

The herbal gel formulations were filled into collapsible metal tubes or aluminium collapsible tubes. The tubes were pressed to extrude the material and the extrudability of the formulation was checked (Bhaskar *et al.,* 2009).

Determination of Spreadability

Two glass slides of standard dimensions (6×2) were selected. The gel formulation whose spreadability had to be determined was placed over one of the slides. The second slide was placed over the slide in such a way that the formulation was sandwiched between them across a length of 6 cms along the slide. 100 grams of weight was placed up on the upper slide so that the gel formulation between the two slides was traced uniformly to form a thin layer. The weight was removed and the excess of the gel formulation adhering to the slides was scrapped off. The lower slide was fixed on the board of the apparatus and one end of the upper slide was tied to a string to which 20 gram load could be applied 50with the help of a simple pulley. The time taken for the upper slide to travel the distance of 6 cms and separate away from lower slide under the direction of the weight was noted. The experiment was repeated and the average of 6 such determinations was calculated for each gel formulation.

$$\text{Spreadability} = \frac{m.l}{t}$$

Where, S=Spreadability (gcm/sec)

m = weight tied to the upper slide (20 grams)

l= length of glass slide (6cms).

t = time taken is seconds.

Determination of pH

The pH of the gels was determined by digital pH meter. One gram of gel was dissolved in 25 ml of distilled water and the electrode was then dipped in to gel formulation until constant reading obtained. And constant reading was noted. The measurements of pH of each formulation were replicated two times (Bhalani and Shah, 2015).

Flavonoids content

The drug content was determined by taking 1gm of gel in 10 ml volumetric flask diluted with methanol. 3 ml of stock solution was mixed with 1 ml of 2% $AlCl_3$ solution. The mixture was vortexed for 15s and allowed to stand for 10min for colour development. The absorbance was measured at 420 nm using a spectrophotometer.

***In vitro* drug diffusion study**

The *in-vitro* diffusion study is carried by using franz diffusion cell. Egg membrane is taken as semi permeable membrane for diffusion. The Franz diffusion cell has receptor compartment with an effective volume approximately 60 mL and effective surface area of permeation 3.14sq.cms. The egg membrane is mounted between the donor and the receptor compartment.

A two cm^2 size patch taken and weighed then placed on one side of membrane facing donor compartment. The receptor medium is phosphate buffer pH 7.4. The receptor compartment is surrounded by water jacket so as to maintain the temperature at 32 ± 0.5°C. Heat is provided using a thermostatic hot plate with a magnetic stirrer. The receptor fluid is stirred by Teflon coated magnetic bead which is placed in the diffusion cell.

During each sampling interval, samples are withdrawn and replaced by equal volumes of fresh receptor fluid on each sampling. The samples withdrawn are analyzed

spectrophotometrically at wavelength 282nm of drug.

***In vitro* antimicrobial activity of herbal gel**

At first, all instruments which were used in laboratory were made sterile, all glassware's like Erlenmeyer flask, graduated cylinders, stirring rods, beakers, test tubes, petri dishes, inoculating loops, that were used in the assay were placed in an autoclave at 121°C under 15 psi pressure for 25 min by using Autoclave and followed aseptic technique method. Nutrient agar media (NAM) was prepared for growing of bacteria inside the laboratory. The standard size (100mm× 15mm) petri dishes as required for whole experiment.

For preparation of NAM, 13 gram powder was mixed with 1000 ml of distilled water and stirred to obtain homogenized mixture. After which, NAM mixture were placed in Autoclave under 15 psi pressure, at 121°C for 25 min for sterilization of media. After that poured the culture media into petri dishes at ratio of 20 ml/dish and was left half covered on the table to let the agar cool down and solidify at room temperature.

Agar well-diffusion method was followed to determine the antimicrobial activity (Bauer *et al.,* 1966). Nutrient agar (NA) plates were swabbed (sterile cotton swabs) with fresh broth culture of bacteria. Wells (6mm diameter) were made in each of these plates using sterile cork borer. 100mg/ml, 50mg/ml and 25mg/ ml solution was prepared of extracts. About 100 µl of different concentrations of extract were added sterile micropipette into the wells and allowed to diffuse at room temperature for 2hrs. Control experiments comprising inoculums distilled water were set up. The plates were incubated at 37°C for 24 h for microbial pathogens. The diameter of the inhibition zone (mm) was measured and the activity index was also calculated. Triplicates were maintained and the experiment was repeated thrice, for each replicates the readings were taken in three different fixed directions and the average values were recorded.

Results and Discussion

The hydroalcoholic extract of *Uraria picta* obtained after extraction was 6.25 g, corresponding to a percentage yield of 12.5% w/w. The obtained yield indicates satisfactory extraction of phytoconstituents from the powdered plant material using the hydroalcoholic solvent system (Table 2).

Preliminary phytochemical screening of the hydroalcoholic extract of *Uraria picta* revealed the presence of alkaloids, glycosides, flavonoids, phenols, proteins, carbohydrates, and diterpenes, whereas saponins, sterols, and tannins were not detected. The presence of these phytoconstituents suggests that the extract may possess diverse pharmacological properties (Table 3).

The hydroalcoholic extract of *Uraria picta* showed a total phenolic content of 0.58 mg/100 mg of dried extract and a total flavonoid content of 0.96 mg/100 mg of dried extract. The presence of phenolic and flavonoid compounds may contribute to the biological activity of the plant extract (Table 4).

All six herbal gel formulations (HG1–HG6) exhibited a light-brown colour, good homogeneity, smooth texture, and absence of clogging. These observations indicated satisfactory physical characteristics of the prepared formulations (Table 5).

The prepared herbal gel formulations showed good washability. HG1–HG3 exhibited average extrudability, whereas HG4 and HG5 showed good extrudability. HG6 exhibited clogging during extrusion. The spreadability, pH, and viscosity varied among the formulations, reflecting the influence of formulation composition on their rheological and handling properties (Table 6).

The optimized herbal gel formulation HG5 exhibited a progressive increase in drug release with increasing time. The formulation showed 35.8 ± 0.1% release at 15 min, which increased to 59.1 ± 0.5%, 75.6 ± 0.2%, 88.4 ± 0.4%, and 97.2 ± 0.3% at 30, 60, 90, and 120 min, respectively. The results demonstrated effective and sustained release of the drug from the herbal gel formulation (Table 7).

The antimicrobial activity of the selected standard drugs was evaluated against *Bacillus subtilis*, *Klebsiella pneumoniae*, and *Candida albicans*. Ciprofloxacin exhibited concentration-dependent antibacterial activity against *B. subtilis* and *K. pneumoniae*, while fluconazole showed increasing antifungal activity against *C. albicans* with increasing concentration (Table 8).

The optimized herbal gel formulation HG5 demonstrated antimicrobial activity against all the tested microorganisms. The zone of inhibition increased with increasing concentration from 25 to 100 mg/ml, indicating concentration-dependent antimicrobial activity. The highest inhibition was observed at 100 mg/ml against *B.*

subtilis (12 ± 0.74 mm), *K. pneumoniae* (10 ± 0 mm), and *C. albicans* (11.6 ± 0 mm) (Table 9).

Table 2: Results of percentage yield of extract of *Uraria picta*

Hydroalcoholic extract	Weight of extract	Percentage yield (w/w)
Uraria picta	6.25	12.5%

Table 3: Result of phytochemical screening of extract of *Uraria picta*

S. No.	Constituents	Hydroalcoholic extract
1.	**Alkaloids**	
	A) Wagner's test:	+Ve
	B) Hager's test:	-Ve
2.	**Glycosides**	
	A) Legal's test:	+Ve
3.	**Flavonoids**	
	A) Lead acetate test:	+Ve
	B) Alkaline reagent test:	+Ve
4.	**Saponins**	
	A) Froth test:	-Ve
5.	**Phenol**	
	A) Ferric chloride test:	+Ve
	B) FC reagent test:	+Ve
6.	**Proteins**	
	A) Xanthoproteic test:	+Ve
7.	**Carbohydrate**	
	A) Fehling's test:	+Ve
	B) Benedict test:	-Ve
8.	**Diterpenes**	
	A) Copper acetate test:	+Ve
9.	**Sterols**	
	A) Salkowski test:	-Ve
10.	**Tannins**	

	A) Gelatin test:	-Ve

Table 4: Estimation of total phenol and flavonoids content of *Uraria picta*

S. No.	Total phenol content (mg/100mg of dried extract)	Total flavonoids content (mg/ 100 mg of dried extract)
1.	0.58	0.96

Table 5: Results of physical appearance

Formulation	Colour	Clogging	Homogeneity	Texture
HG1	Light Brown	Absent	Good	Smooth
HG2	Light Brown	Absent	Good	Smooth
HG3	Light Brown	Absent	Good	Smooth
HG4	Light Brown	Absent	Good	Smooth
HG5	Light Brown	Absent	Good	Smooth
HG6	Light Brown	Absent	Good	Smooth

Table 6: Results of Washability and Extrudability

Formulation	Washability	Extrudability	Spreadability (gcm/sec)	Spreadability (gcm/sec)	Determination of pH	Viscosity (cps)
HG1	Good	Average	27.4±1	27.4±1	6.7±0.4	4241±10
HG2	Good	Average	23.9±4	23.9±4	7.1±0.1	4617±13
HG3	Good	Average	30.5±2	30.5±2	5.3±0.2	4125±19
HG4	Good	Good	34.7±2	34.7±2	7.2±0.5	3473±17
HG5	Good	Good	22.6±1	22.6±1	6.8±0.3	3141±12
HG6	Good	Clogging	28.1±5	28.1±5	7.4±0.6	3579±20

Table 7: Results of *in-vitro* drug release study of herbal gel formulation (HG5)

S. No.	Time (Min.)	Percentage drug release
1.	15	35.8±0.1
2.	30	59.1±0.5
3.	60	75.6±0.2
4.	90	88.4±0.4
5.	120	97.2±0.3

Table 8: Antimicrobial activity of Ciprofloxacin against selected microbes

S. No.	Name of drug	Name of microbes	Zone of Inhibition (mm)

			10 µg/ml	20 µg/ml	30 µg/ml
1.	Ciprofloxacin	*Bacillus subtilis*	15±0	18±0	20±0.57
		Klebsiella pneumoniae	17±0.57	20±0.86	24±0.47
2.	Fluconazole	*Candida albicans*	18±0.5	20±0.74	25±0.94

Table 9: Antimicrobial activity of optimized herbal gel (HG5) against selected microbes

S. No.	Name of microbes	Zone of inhibition (mm)		
		25mg/ml	50 mg/ml	100mg/ml
1.	*Bacillus subtilis*	8±0.57	10±0.94	12±0.74
2.	*Klebsiella pneumoniae*	7±0.86	9±0.57	10±0
3.	*Candida albicans*	9±0.3	10.3±0.5	11.6±0

***Average of three determination**

Conclusion

The hydroalcoholic extract of *Uraria picta* showed satisfactory extraction yield and contained several important phytoconstituents, including phenolics and flavonoids. The prepared herbal gel formulations exhibited acceptable physical properties, with HG5 identified as the optimized formulation based on its formulation characteristics and drug-release profile. HG5 showed progressive drug release and demonstrated concentration-dependent antimicrobial activity against *B. subtilis*, *K. pneumoniae*, and *C. albicans*. The findings indicate that the optimized *Uraria picta* herbal gel has promising potential as an antimicrobial topical formulation.

References

- Hay RJ, Johns NE, Williams HC, Bolliger IW, Dellavalle RP, Margolis DJ, Marks R, Naldi L, Weinstock MA, Wulf SK, Michaud C. The global burden of skin disease in 2010: an analysis of the prevalence and impact of skin conditions. *J Invest Dermatol*. 2014;134(6):1527-1534.
- Madawi EA, Al Jayoush AR, Rawas-Qalaji M, Thu HE, Khan S, Sohail M, Mahmood A, Hussain Z. Polymeric nanoparticles as tunable nanocarriers for targeted delivery of drugs to skin tissues for treatment of topical skin diseases. *Pharmaceutics*. 2023;15(2):657.

- Hussein RA, El-Anssary AA. Plants secondary metabolites: the key drivers of the pharmacological actions of medicinal plants. *Herbal Medicine*. 2019;1(3):11-30.
- Bittner Fialová S, Rendeková K, Mučaji P, Nagy M, Slobodníková L. Antibacterial activity of medicinal plants and their constituents in the context of skin and wound infections, considering European legislation and folk medicine—a review. *Int J Mol Sci*. 2021;22(19):10746.
- Yadav R, Gorki V, Thakur S, Kansal S, Gupta S, Kumar B, Kaur U, Medhi B, Sehgal R. Phytochemical analysis and toxicity evaluation of *Uraria picta* (Jacq.) Desv. ex DC. through in vitro and in vivo approaches. *Next Research*. 2025:100730.
- Saxena HO, Soni A, Mohammad N, Choubey SK. Phytochemical screening and elemental analysis in different plant parts of *Uraria picta* Desv.: a Dashmul species. *J Chem Pharm Res*. 2014;6(5):756-760.
- Olayemi OJ, David C. Emulgel: a promising technology for topical delivery of herbal extracts. *Br J Pharm*. 2023;8(1):1-3.
- Ansari HS. *Essentials of Pharmacognosy*. Pune: Nirali Prakashan; 2001. p. 591-592.
- Mukherjee PK. *Quality Control of Herbal Drugs*. 2nd ed. Business Horizons; 2007. p. 2-14.
- Khandelwal KR, editor. *Practical Pharmacognosy: Techniques and Experiments*. 23rd ed. 2005. p. 15.
- Kokate CK, editor. *Practical Pharmacognosy*. 4th ed. Vallabh Prakashan; 1994. p. 112-120.
- Parkhe G, Bharti D. In vitro antioxidant activity, total phenolic and flavonoid contents of hydroalcoholic extract of leaves of *Lagerstroemia parviflora* Roxb. *J Drug Deliv Ther*. 2019;9(4-A):708-711.
- Nand P, Drabu S, Gupta RK, Bhatnagar A, Ali R. In vitro and in vivo assessment of polyherbal topical gel formulation for the treatment of acne vulgaris. *Int J Drug Deliv*. 2012;4:434-442.
- Yamini K, Onesimus T. Preparation and evaluation of herbal anti-acne gel. *Int J Pharm Bio Sci*. 2013;4(2):956-960.

- Bhalani U, Shah K. Preparation and evaluation of topical gel of *Nigella sativa* (kalonji). *Int J Res Dev Pharm Life Sci*. 2015;4(4):1669-1672.
- Bhaskar G, Arshia A, Priyadarshini SRB. Formulation and evaluation of topical polyherbal antiacne gels containing *Garcinia mangostana* and *Aloe vera*. *Pharmacogn Mag*. 2009;5(19):93-99.
- Bauer AW, Kirby WMM, Sherris JC, Turck M. Antibiotic susceptibility testing by a standardized single disk method. *Am J Clin Pathol*. 1966;45(4):493-496.