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"FORMULATION AND EVALUATION OF A POLYHERBAL TOPICAL CREAM CONTAINING LACTUCA SATIVA AND CURCUMA LONGA WITH ANALGESIC AND ANTIMICROBIAL POTENTIAL"

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ABSTRACT

Objective: The objective of the present investigation was to formulate and evaluate a polyherbal topical cream containing extracts of *Lactuca sativa* and *Curcuma longa* with analgesic and antimicrobial potential. **Methods:** An oil-in-water topical cream was formulated using beeswax and borax as emulsifying agents. Polyherbal extracts were incorporated into the cream base and five formulations (F1–F5) were prepared by varying excipient concentrations. The formulations were evaluated for physicochemical parameters such as pH, spreadability, viscosity, homogeneity, washability, acid value, saponification value, and phase separation. In-vitro drug release was studied using a Franz diffusion cell. **Results:** Among the prepared 5 batches of herbal formulation, batch 4 exhibited optimal physicochemical characteristics, possessing pH 5.8, spreadability of 20gcm/sec, and a viscosity of 2500 cps, which lies within an acceptable limits with no phase separation, compared to other batches. **Conclusion:** The formulated polyherbal cream demonstrated

acceptable pharmaceutical properties and potential therapeutic utility. In vitro study for drug release was showed good acceptance of optimized formulation. Further pharmacological and antimicrobial studies are warranted.

KEYWORDS: *Lactuca sativa*, *Curcuma longa*, Polyherbal cream, Topical drug delivery, Herbal semisolid, Drug release, Franz diffusion cell.

INTRODUCTION

In the recent years, development of polyherbal topical formulations has gained interest as a promising pharmaceutical strategy, since rational combination of medicinal plants can cause an increase in antimicrobial activity or, if combined with analgesic agents, it will offer greater therapeutic efficacy and safety as well as broader pharmacological actions in pain and bacterial infection management.

Plants have been used as therapeutic agents from very old times to treat a variety of human disorders because of their safety, inexpensive nature, and reliability.[1] In recent years, herbal topical formulations have assumed greater significance due to their site-specific action and absence of first-pass metabolism. Topical creams in particular are commonly used for the transdermal delivery of antimicrobial, anti-inflammatory, and analgesic agents; they offer advantages over other forms of administration such as local delivery at the site of application, patient convenience, and good compliance.[2] Although topical agents are effective, their use can lead to side effects including skin irritation, allergies, and acquired resistance. Accordingly, it has become desirable to develop relatively safer and sustainable formulations of herbal-based topicals.[3]

These herbal formulations were assumed to possess various biological activities, such as Anti-microbial, Anti-inflammatory, antibacterial, etc. Additionally, these formulations are also believed to possess wound healing properties also, making them ideal alternative to the chemical formulations.

Wound is the physiological interruption of the cellular and anatomic continuity of cells that may be caused by physical, chemical, microbiological and immunological damage.[4-5] Tissue repair is a process which encompasses several biochemical-mediated events, in order to regenerate and restore the injured tissues, viewed through antioxidant defence, epithelisation and remodelling.[6,7] There are various treatments available, such as non-steroidal, analgesics

and commercial antibiotics or anti-inflammatory drugs for wound healing; however most of these treatments have some side effects.[8,9]

Natural formulations are believed to be effective at healing with few or no side effects due to the multiple constituents which work synergistically together. The present study contains *Lactuca sativa* and *Curcuma longa* as main herbal ingredients used for their proven pharmacological activities. *Lactuca sativa* has analgesic and anti-inflammatory effects due to the presence of lactucarium and flavonoids, whereas Curcuma longa is a source of curcuminoids with potent antimicrobial, antioxidant, and wound-healing potential. A combination of these two herbs is anticipated to exhibit synergetic analgesic and antimicrobial activities in the topical cream. Such a polyherbal approach provides a safer and efficacious alternative to the synthetic topical preparations prevalent today.[10]

A compound, a leaves of *Lactuca sativa*, used as a salad vegetable. It is available in many varieties, including iceberg, romaine and butterhead. Lettuce is rich in vitamins A and K, and low in calories with a moderate level of fibre. Its crunchy texture and bland flavour means it is favoured for salads, but versatile enough for various other recipes. Lettuce contains Lactucarium, which has mild sedative properties. Some old-fashioned treatments claim that it might have a mild sedative effect, so perhaps it could offer some slight comfort to headaches or insomnia.[10,11]

Lactuca sativa is reported to possess analgesic and anti-inflammatory properties attributed to bioactive constituents such as lactucarium and flavonoids. Curcuma longa is well known for its antimicrobial, antioxidant, and wound healing properties due to the presence of curcuminoids.

As an herbal remedy, the wild lettuce is also widely sold in a dried herb format, which can sometimes make it difficult to extract the correct dose for use in teas and capsules. But, there's no definitive evidence of efficacy and safety with wild lettuce in pain. Moreover, animal experiments in mice demonstrated the analgesic and sedative properties of wild lettuce. Because it is believed to have pain killing and anti-inflammatory properties, some health food stores even sell wild lettuce as a supplement for pain. Nevertheless, there is insufficient evidence for the effectiveness and safety of wild lettuce in pain.[12]

Turmeric (*Curcuma longa* L.) is a member of the Family Zingiberaceae, which is often used as a spice and food colorant and for medicinal purposes. Turmeric – an aromatic perennial herb- found all over Asia, India and China among other tropical countries. The rhizomes of turmeric have been used historically for the purpose of insecticides, antimicrobials, antidiabetic oftentimes and also in the treatment of rheumatism, body ache, skin disease, and intestinal worm as well as in leukoderma inflammatory that too colic.[13]

The combination of these herbal drugs is expected to provide synergistic analgesic and antimicrobial activity. The present study aims to formulate and evaluate a stable polyherbal topical cream containing extracts of *Lactuca sativa* and *Curcuma longa*.

Thus, in the era of increasing preference for herbal formulations over synthetic drugs, there is a demand for herbal formulations comprising both safety and therapeutic efficacy and with high patient acceptance. With this background, the present study deals with formulating and assessing of a topical cream prepared from extracts of *Lactuca sativa* and *Curcuma longa* for its analgesic and antimicrobial activity. The research focuses on optimization of formulation, characterization of physicochemical properties and determination of stability profile to develop a new herbal loaded topical, which is hypothesized to provide broad-spectrum activity.

Lettuce (*Lactuca sativa*) **Turmeric (Curcuma longa)**

Fig. No. 1: Plant material of Lettuce and Turmeric.

Topical drug delivery systems are widely used for localized therapeutic action while minimizing systemic side effects. Herbal formulations have gained increasing attention due to their safety, biocompatibility, and therapeutic efficacy. In-vitro drug release studies play a

crucial role in predicting the performance of topical formulations and ensuring batch-to-batch consistency. The Franz diffusion cell is a well-established and internationally accepted method for evaluating drug release and permeation behavior across membranes, simulating skin conditions. The present study focuses on the in-vitro release characteristics of a herbal cream containing *Curcuma longa* and *Lactuca sativa* extracts.

MATERIALS AND METHODS[14-16]

The herbal materials—leave of *Lactuca sativa* and rhizomes of *Curcuma longa*—were procured from local authenticated sources. Excipients used included beeswax, borax, liquid paraffin, methylparaben, propylparaben, rose water, and distilled water (all analytical grades). All materials and reagents complied with Indian Pharmacopoeia standards. Extraction of *Lactuca sativa*: The leaves were shade-dried for 72 hours, pulverized, and sieved (mesh no. 60). 40 gm of powder was extracted with 100 mL of distilled water using a Soxhlet apparatus for 24 hours. The filtrate was concentrated and further purified by decoction, followed by drying at 60 °C to obtain a semi-solid extract.

Extraction of *Curcuma longa*: Finely ground turmeric was subjected to solvent extraction using dichloromethane under reflux for 1 hour. The extract was filtered, concentrated at 50 °C, and washed with hexane to yield a reddish-yellow curcuminoid-rich solid. Formulation of Herbal Cream: The cream base was prepared using two-phase emulsification (oil-in-water type).

The hot aqueous phase was slowly added to the oil phase with continuous stirring until uniform emulsification was achieved. The herbal extracts were incorporated into the cooled base with gentle trituration. Five trial batches (F1–F5) were prepared by varying beeswax and borax concentrations. Batch F4 showed superior uniformity and stability.

Formulation of Herbal Cream: An oil-in-water cream was prepared using emulsification technique. Five formulations (F1–F5) were prepared by varying emulsifying agent concentrations.

Extraction of Lettuce

Leaves of *Lactuca sativa* are taken and dried for up to 72 hours

⇩

Dried leaves are ground using a sieve number 60

⇩

Leaf powder is extracted using Soxhlet apparatus, condenser, and round bottom flask

⇩

40gm of dry lettuce powder is added to 100ml of water in the round bottom flask

⇩

Set up the extraction process with lower side RBF attached to Soxhlet apparatus and upper side attached to condenser.

⇩

Dry lettuce powder packed in Whatman filters paper and Placed in a pouch and placed in Soxhlet apparatus

⇩

After 24 hours, extract the dry powder of lettuce and Collect extract and filter it

⇩

Filtrate is dry in the form of extract powder. Extract powder is used in decoction process for higher purity

⇩

Decoction process involves adding 1gm of extract powder to 100ml warm distilled water in a beaker at 80° Celsius

⇩

Semi-solid sample is placed into a petri dish and Sample is spread in a thin layer

⇩

Petri dish is placed into a hot air oven at 60°C and Sample is left in oven for 12 hours

⇩

Purified powder is collected after 12 hours and Sample becomes semi-solid after the process.

Extraction of Turmeric

Curcumin is soluble in organic solvent

⇩

Organic solvent used for isolation of curcumin

⇩

Technique developed for isolating curcumin from ground turmeric

⇩

Ground turmeric magnetically stirred in dichloromethane

⇩

Heated at reflux for 1 h and Mixture suction-filtered

⇩

Filtrate concentrated in hot- water bath at 50°C

⇩

Reddish-yellow oil residue

⇩

Organic solvent used for isolation of curcumin

⇩

Technique developed for isolating curcumin from ground turmeric

⇩

Ground turmeric magnetically stirred in dichloromethane

⇩

Heated at reflux for 1 hr

⇩

Mixture suction-filtered

⇩

Filtrate concentrated in hot- water bath at 50°C

⇩

Reddish-yellow oil residue triturated with hexane

⇩

Resulting solid collected by suction filtration

Preformulation Studies

Preformulation studies of herbal drugs involve evaluating their physicochemical properties such as solubility, stability, particle size, crystallinity, and compatibility. These studies help in developing safe, effective, and stable dosage forms while considering the complex mixture

of phytoconstituents present in herbal drugs.

Drying of Lettuce Leaves: Lettuce leaves were properly cleaned with water; one batch was dried in open air and the other in oven at 50 °C for 6 hours.

Particle Size Measurement with Sieve Method: The particle size distribution of all samples were determined by sieve analysis (Ritsch, Germany) using the sieve No. 10, 14, 18, 25, 35, 60, 80, and 120 in a series. The samples were subjected to vibration using sieve vibrato (Ritsch, Germany) for 15 minutes period of time.

Angle of Repose: The static angle of repose, a, was measured according to the fixed funnel and free-standing cone method. A funnel was clamped with its tip 2cm above a graph paper placed on a flat horizontal surface. The powders were carefully poured through the funnel until the apex of the cone thus formed just reached the tip of the funnel. The mean diameters of the base of the powder cones were determined and tangent of the angle of repose calculated using the equation:

$$\left[Tan\ \phi\ = \frac{2h}{D}\right]$$

Bulk and Tapped Densities: The bulk volume (Vo) of 50 gm granules was recorded in a 100 ml measuring cylinder as well as the volume after taping till constant volume. Bulk and tapped densities in g/ml were calculated as 50/Vo and 50/Vr, respectively.

$$\left[Bulk\ density = \frac{M}{V}\right] g/cm^2$$

Where:

M = mass of powder in the density cup in grams and

V = volume of the density cup in cubic centimetres

Hausners Ratio: This was calculated as the ratio of tapped density to the bulk density of the samples.

Carr's Index: The compressibility index (C %) was calculated from the bulk and tapped density using the equation,

$$\left[C\% = \left\{\frac{\rho T - \rho B}{\rho T}\right\} * 100\right]$$

Where the ρB is bulk density and ρT is tapped density.

Loss on Drying: In this 2gm of turmeric powder is placed in Hot Air Oven for the moisture content at the temperature of about 80° C.

Solubility:

Manufacturing Procedure

General Manufacturing procedure for Formulation of Antimicrobial and Analgesic cream:

Step 1: Weighed accurately Extracted Lettuce and Turmeric powder respectively added in to mortar.

Step 2: Formulation of cream base.

Formulation was prepared by adding two different phases which are as follows,

Phase 1: Weighed accurately solid ingredients and Melted by indirect heat then added all the oils in it and stir well.

Phase 2: Dissolve the borax in water with the help of heat.

While still hot add the phase 1 into the phase 2 gradually with constant stirring to the wax and oil mixture. Continue this process for 5 minutes, stir all the time then remove from the heat and stir until it gets cold.

Step 3: In the above paste we have added our API which is Lettuce and Turmeric.

Experimental Work

Different trials were taken for optimization of Cream base, Emollient and Emulsifying agents. Table No. 1 explains the composition of different batches.

Table 1: Composition of Formulation Batches

Sr. No	Ingredient	Quantity Taken (%)	Formulation Batches				
			F1	F2	F3	F4	F5
1	Lettuce	4.5 %	1 gm	1 gm	1 gm	1gm	1gm
2	Turmeric	4.5%	1 gm	1 gm	1 gm	1 gm	1gm
3	Bees wax	9.9%	2.2 gm	1 gm	2.2 gm	2.2 gm	3.2 gm
4	Borax	0.72%	1.16 gm	2.36 gm	2.16 gm	0.16 gm	0.16 gm
5	Propyl paraben	0.045%	0.01 gm	0.01 gm	0.01 gm	0.01gm	0.01 gm
6	Methyl paraben	0.045%	0.01 gm	0.01 gm	0.01 gm	0.01gm	0.01 gm
7	Liquid Paraffin	49.5%	10 ml	10 ml	4.29 gm	11 ml	10 ml

8	Rose Water	3.025%	0.60 ml	0.62 ml	0.67 ml	0.67 ml	0.67 ml
9	Water	27%	6 ml	6ml	6 ml	6 ml	6 ml

Procedure:

A. Dispensing and Sifting:

i. Purchase the Lettuce Leave in market.

ii. Drying of Lettuce Leaves: - Lettuce leaves were properly cleaned with water; one batch was dried in open air and the other in oven at 50 °C for 6 hours.

iii. Particle Size Measurement with Sieve Method: - The particle size distribution of all samples was determined by sieve analysis (Ritsch, Strasse, Germany) using the sieve No. 14, 18, 25, 35, 60, 120 in a series. The samples were subjected to vibration using sieve vibrato (Ritsch, Strasse, Germany) for certain period of time.

iv. Extraction of lettuce drying powder.

v. Decoction of lettuce extract powder: - Take a 1gm of lettuce extract powder in 10ml of water and then placed on magnetic stirrer for 2hrs with stirring. After time, take into petri dish place this solution for drying in hot air oven for 24hrs. Collect the powder after 24hrs.

B. Preparation of Cream Base:

Firstly prepare cream base in that required quantity of excipient like bees wax, borax, liquid paraffin, rose water and water were added manually and mixed for 05-10 minutes by hand operated in mortar.

C. Addition of Solid Material:

Further remaining solid material like Methyl paraben and Propyl paraben were added manually in above base of cream and mixed it for 2-3 minutes by hand operated in mortar.

D. Mixing and Trituration:

Further Lettuce powder mixed in step C and then properly mixed using mortar and pestle.

***In-Vitro* Drug Release Study[17,18]**

The in-vitro drug release study was performed using a Franz diffusion cell consisting of donor and receptor compartments separated by a diffusion membrane. The membrane was pre-soaked in phosphate buffer pH 7.4. The receptor compartment was filled with the same buffer and maintained at 37 ± 0.5 °C with continuous stirring. A known quantity of the herbal

cream was applied uniformly to the donor compartment. Samples were withdrawn from the receptor compartment at predetermined time intervals (0.5, 1, 2, 4, 6, and 8 h), and an equal volume of fresh buffer was replaced to maintain sink conditions. The samples were analyzed using UV–Visible spectrophotometry at λmax.

Calculation of Cumulative Drug Release

The amount of drug released was calculated using the equation:

Amount released (µg) = C × $A = \pi r^2 V$

Where:

C = drug concentration (µg/mL) and

V = receptor compartment volume (mL).

Cumulative drug release was corrected for sampling using the equation:

$$Q_n = (C_n \times V) + \Sigma (C_i \times V_s)$$

The percentage cumulative drug release was calculated as:

$$\%\ \text{Cumulative drug release} = (Q_n / \text{Total drug loaded}) \times 100$$

RESULTS

Pre formulation studies: These studies identified essential physicochemical properties of the herbal drug, supporting the development of a safe and stable dosage form and findings were mentioned in Table No. 2.

Table 2: Preformulation studies of Lettuce and Turmeric powder.

Sr. No	Parameter	Lettuce	Turmeric
1	Color	White	Yellow
2	Odor	Unpleasant	Aromatic
3	Taste	Earthiness	Slight ginger
4	Bulk density	0.46	0.55
5	Tapped Density	0.68	0.70
6	Angle of repose	25.6 (Good)	26.10
7	Carr's index	22.5 (Passable)	19.5
8	Hausner's Ratio	1.22 (Fair)	1.27
9	% loss on drying	19%	24.5%
10	Particle size	0.250 mm (sieve no-60)	0.177 mm (sieve no- 80)
11	Solubility		
	Water	Partial Soluble	Solubility
	Acetone	Soluble	More Solubility

	Ethanol	Partial Soluble	Solubility
	Diethyl ether	Partial Soluble	No Solubility

Evaluation Tests

The prepared creams were evaluated for appearance, pH, spreadability, viscosity, washability, homogeneity, phase separation, acid value, and saponification value using standard procedures. The results were mentioned in Table no. 3.

Table 3: Evaluation test of different batches of Formulation cream.

Sr. No.	Parameter	F1	F2	F3	F4	F5
1	Color	Brownish	Brownish	Brownish	Orange	Orange
2	Odor	Aromatic	Aromatic	Aromatic	Aromatic	Aromatic
3	Appearance	Dry texture	Liquefied texture	Dry texture	Smooth texture	Smooth texture
4	Washability	Washable	Less washable	Washable	Easily Washable	Easily Washable
5	pH	5.9	6.8	6.4	5.8	6.1
6	Spreadability	10 g.cm/s	28g.cm/s	9 g.cm/s	20g.cm/s	18g.cm/s
7	Phase Separation	Yes	Yes	Yes	No	No
8	Greasiness	Medium	High	Medium	Less	Less
9	Viscosity	1400cps	3500cps	1500cps	2500cps	2100cps
10	Saponification Value	26.2%	23.2%	26.8%	27.4%	30.1%
11	Acid value	6.4 mg/gm	6.8mg/gm	6.4mg/gm	5.9mg/gm	5.8% mg/gm
12	Homogeneity	Opaque	Greasy	Opaque	Smooth	Homogenous[1]

After analysing all the evaluation parameters the F4 batch was optimized for formulation.

The Table no. 4 explains combination of optimized formulation.

1. (Spreadability was measured by two-glass slide method with fixed weight; and viscosity was measured by Ostwald viscometer, and homogeneity was evaluated by visual method).
2. Visual inspection was used to evaluate phase separation after subjecting the formulation to centrifugation at 3000 rpm for 30 minutes and storage at 25 ± 2 °C for 30 days.

Table 4: Final Optimized Formulation

Sr. No	Ingredient	Quantity Taken (%)	Formulation Batches
			F4
1	Lettuce	4.5%	1gm
2	Turmeric	4.5%	1 gm
3	Bees wax	9.9%	2.2 gm
4	Borax	0.72%	0.16 gm
5	Propyl paraben	0.045%	0.01 gm
6	Methyl paraben	0.045%	0.01 gm
7	Liquid Paraffin	49.5%	11 ml
8	Rose Water	3.015s%	0.67 ml
9	Water	27%	6 ml

In-vitro study

The herbal cream showed a gradual increase in cumulative drug release with time, indicating controlled diffusion of active constituents across the membrane. The release data are presented in Table 5 and Graph of Diffusion cell presented in Figure No. 2.

Table 5: Cumulative Drug Release Profile of Herbal Cream.

Time (Min.)	Cumulative Drug Release
0	0
30	11.8±0.8
60	20.9±1.1
120	34.2±1.4
180	45.8±1.7
240	58.7±2.0
360	73.3±2.3
480	85.4±2.5[2]

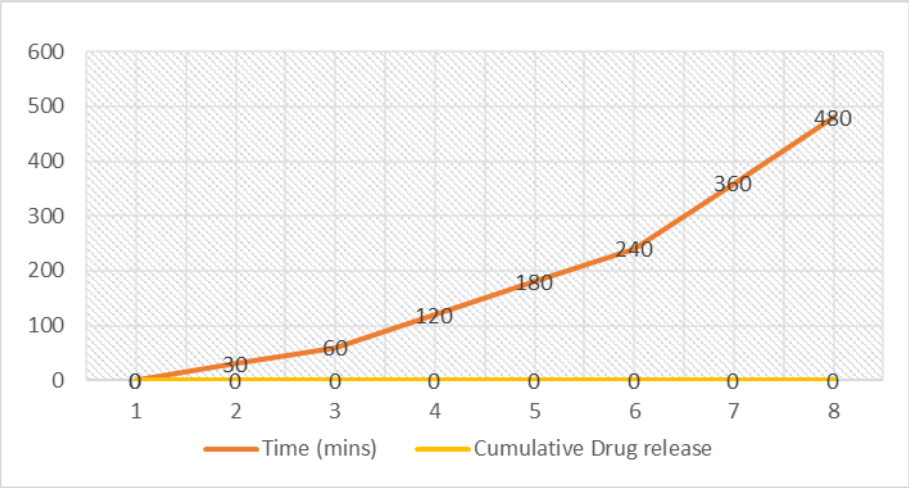

Fig. No. 2: Cumulative drug release profile of the optimized herbal cream (F4). Data points represent mean ± SD (n=3).

DISCUSSION

The present study focused on the development and evaluation of a herbal topical cream with analgesic and antimicrobial activity using extracted herbal drug powder and in-house excipients such as beeswax, borax, methyl paraben, and propyl paraben. The formulation was designed for topical application to manage minor cuts, burns, and wound healing in both adults and children. Several formulations were prepared and evaluated for their physical and pharmaceutical characteristics, including appearance, homogeneity, pH, viscosity, spreadability, and stability.

Among all the formulations, F4 demonstrated the most desirable pharmaceutical properties. The pH of formulation F4 was found to be within the acceptable range for skin application, minimizing the risk of irritation. The viscosity was appropriate, allowing easy application with good spreadability over the skin surface. Additionally, the absence of phase separation during stability studies indicated good formulation stability. The cream also showed uniform texture, smooth consistency, and satisfactory appearance, which are essential for patient acceptability.

The results obtained in this study are in good agreement with previously reported herbal topical formulations, confirming the reliability of the formulation approach. Overall, formulation F4 can be considered a stable, effective, and promising herbal topical cream for local therapeutic use.

The in-vitro diffusion profile demonstrated sustained release behavior of the herbal cream over an 8-hour period. The controlled release pattern may be attributed to the semisolid matrix of the formulation, which regulates diffusion of the herbal constituents. Such release behavior is desirable for topical formulations, as it can prolong drug residence time at the site of application and enhance therapeutic efficacy. The Franz diffusion cell method effectively simulated skin-like conditions and provided reliable data on the release characteristics of the formulation.

CONCLUSION

A stable and effective polyherbal topical cream containing extracts of *Lactuca sativa* and *Curcuma longa* was successfully developed with analgesic and antimicrobial activity. Extraction and preformulation studies showed acceptable physicochemical properties suitable for incorporation into a semisolid dosage form. The optimized formulation exhibited skin-compatible pH, appropriate viscosity, good spreadability, uniformity, absence of phase separation, and satisfactory physical stability. Preliminary in-vitro release studies indicated promising transdermal drug delivery potential, while the cast transdermal patch films demonstrated acceptable mechanical properties. Overall, the findings suggest that the formulated plant-based topical system possesses good therapeutic potential; however, further in-vitro studies (*In-vitro* antimicrobial assay, commonly involving broth microdilution against common skin pathogens) and In-vivo analgesic models (involving hot-plate tests in rodents) were required to evaluate the quality, safety and efficacy of prepared formulation . The in-vitro drug release study confirmed that the formulated herbal cream exhibits

controlled and sustained release of active constituents. The Franz diffusion cell technique proved to be a suitable and reproducible method for evaluating topical drug release. The results suggest that the developed formulation has potential for effective topical application.

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ABBREVIATIONS

1. g.cm/s – gram centimetre per second
2. g/cm^2 – gram per square centimetre
3. cps – Centipoise
4. gm – grams
5. °C – degree Celsius
6. cm - centimetre
7. mL – millilitre
8. g/ml – gram per millilitre

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Conflict of interest: The authors declare that there is no conflict of interest.

Ethical Statement: No human or animal subjects were involved in this study.

Authors Contribution

1. Mr. Abhishek Patil

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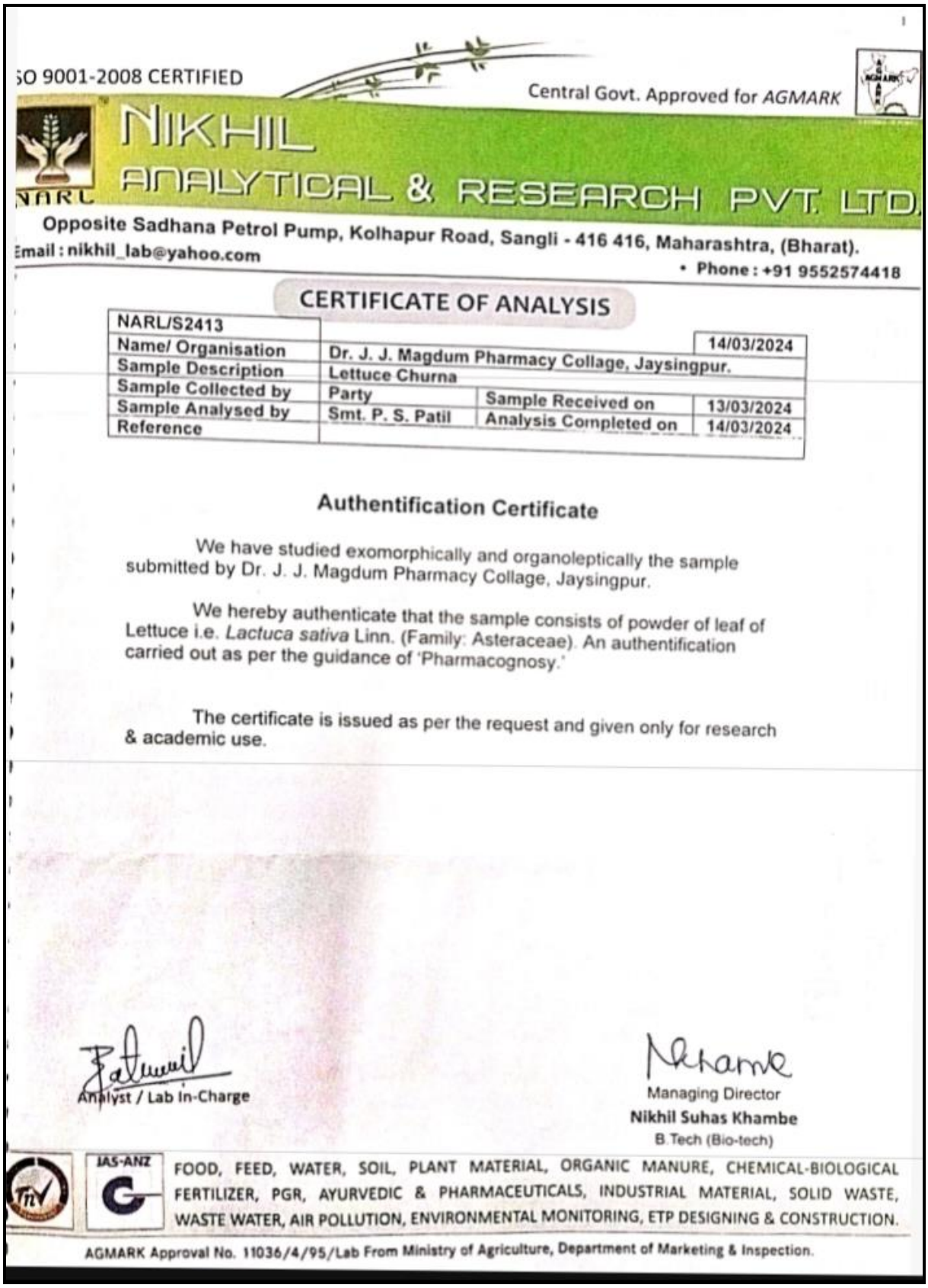
ANNEXURE

I. PLANT AUTHENTICATION CERTIFICATE



ISO 9001-2008 CERTIFIED

Central Govt. Approved for AGMARK

NIKHIL ANALYTICAL & RESEARCH PVT. LTD.

NARL

Opposite Sadhana Petrol Pump, Kolhapur Road, Sangli - 416 416, Maharashtra, (Bharat).

Email : nikhil_lab@yahoo.com

• Phone : +91 9552574418

CERTIFICATE OF ANALYSIS

NARL/S2413			14/03/2024
Name/ Organisation	Dr. J. J. Magdum Pharmacy Collage, Jaysingpur.		
Sample Description	Lettuce Churna		
Sample Collected by	Party	Sample Received on	13/03/2024
Sample Analysed by	Smt. P. S. Patil	Analysis Completed on	14/03/2024
Reference			

Authentification Certificate

We have studied exomorphically and organoleptically the sample submitted by Dr. J. J. Magdum Pharmacy Collage, Jaysingpur.

We hereby authenticate that the sample consists of powder of leaf of Lettuce i.e. *Lactuca sativa* Linn. (Family: Asteraceae). An authentification carried out as per the guidance of 'Pharmacognosy.'

The certificate is issued as per the request and given only for research & academic use.

Analyst / Lab In-Charge

Managing Director

Nikhil Suhas Khambe

B.Tech (Bio-tech)

IAS-ANZ

FOOD, FEED, WATER, SOIL, PLANT MATERIAL, ORGANIC MANURE, CHEMICAL-BIOLOGICAL FERTILIZER, PGR, AYURVEDIC & PHARMACEUTICALS, INDUSTRIAL MATERIAL, SOLID WASTE, WASTE WATER, AIR POLLUTION, ENVIRONMENTAL MONITORING, ETP DESIGNING & CONSTRUCTION.

AGMARK Approval No. 11036/4/95/Lab From Ministry of Agriculture, Department of Marketing & Inspection.

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CERTIFICATE OF ANALYSIS

NARL/S2310/3			04/03/2024
Name/ Organisation	Dr. J. J. Magdum Pharmacy Collage, Jaysingpur.		
Sample Description	Haridra Churna		
Sample Collected by	Party	Sample Received on	28/02/2024
Sample Analysed by	Smt. P. S. Patil	Analysis Completed on	04/03/2024
Reference			

Authentification Certificate

We have studied exomorphically and organoleptically the sample submitted by Dr. J. J. Magdum Pharmacy Collage, Jaysingpur.

We hereby authenticate that the sample is powder of dried and cured rhizomes of Haridra i. e. *Curcuma longa* Linn. (Family: Zingiberaceae). An authentification carried out as per the guidance of 'Ayurvedic Pharmacopoeia Volume I.'

The certificate is issued as per the request and given only for research & academic use.

Analyst / Lab In-Charge

Managing Director
Nikhil Suhas Khambe
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