



Development and Evaluation of Curcumin Loaded Nano Herbal Gel for the Treatment of Psoriasis

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ABSTRACT:

Aim and Objective: Psoriasis is the most common chronic autoimmune disease. The main objective of the present study was to develop dendrimer based topical gel of curcumin (CUR) that acts as a potential system for the treatment of psoriasis. **Methods:** Firstly prepared gel base and dissolve dendrimer. Then HPMC was added in the gel base. Two formulations were developed. Evaluation studies like homogeneity, viscosity, spreadability, pH and In vitro studies were carried out for all gel formulations. In vivo animal studies were carried out for optimized formulation using mouse model of imiquimod-induced psoriasis. **Results:** The physical and chemical characteristics exhibited by the prepared curcumin loaded gels (HP01-HP02) were found to be optimal. The optimization resulted in achieving formulation HP02 with 89.12% in vitro drug release and 93.21% drug contents. Histopathology studies revealed that prepared nanogel has promising anti-psoriatic activity. **Conclusions:** From the experimental findings it has been concluded that CUR significantly augmented the anti-psoriatic efficacy with respect to individual components and also reduced the time required for onset of effect. Thus, the proposed nanogel would be an imperative drug delivery system for more effective anti-psoriatic therapy.

Keywords: Herbal medicine, Psoriasis, gel, Nanotechnology

INTRODUCTION:

Psoriasis is an enduring autoimmune disease which causes inflammation to the skin. Psoriasis is categorized by different clinical manifestations and each class of psoriasis is characterized by examine the mild, moderate to severe symptoms on skin. These symptoms generally include the white or red colour of irregular skin; the patches are commonly itchy and scaly to the skin. (1) Psoriasis skin is evaluated by itching, red scalps, white scales and rashes are developed on the skin. In psoriasis commonly the skin, joints and nails are affected. However, there are different clinical types of psoriasis are available, but the plaque type of psoriasis is the most common obtainable form of psoriasis which affect most of peoples worldwide. Psoriasis is a non-epidemic infectious disease and terrible skin disorder, which affects the person emotionally, psychologically and clinically. (2, 3) In the study of (IFPA) International Federation of Psoriasis Associations, just about the 3 % of the world's population has affected by psoriasis. The estimate is about 125 million peoples. (4) In India, there is about 10 million cases of psoriasis are observed annually. So according to their increasing growth it enlists under common skin disorder, and at present it is important to doing more work for the treatment of psoriasis.

In recent times phytopharmaceuticals have gained a lot of attention and interest by the researchers, and they are striving hard to develop something more efficient, safe and reliable for anti-psoriatic therapy. In near future diverse new molecules, viz., phytoconstituents (Curcumin, Capsaicin, Silymarin, Quercetin, Berberine, Beta amyryn etc.) could support the therapies which are now in use. These phytoconstituents have better therapeutic value and fewer side effects. Present work has been carried out using curcumin which is one of the major phytoconstituents having anti psoriatic activity (5, 6).

Curcumin (CRN) is a natural polyphenolic phytochemical, extracted from rhizome of turmeric (*Curcuma longa*) having many biological and pharmacological activities such as antioxidant, antitumor, anti-inflammatory, anti-psoriatic, anti-carcinogenic, free radical scavenger, to list a few (7). Its physical properties include some challenging aspects which further makes him a candidate of choice for research and development. It is poorly water soluble, highly photoreactive agent with rapid metabolism and poor absorption that leads to deprived bioavailability. To date, numerous reports have proposed and proven its significant effect and potential in alleviating psoriasis along with properties of numerous receptors to which curcumin binds (8-10).

Nanotechnology and nanomedicines despite being exceptionally vast research meadows offers solutions to many unsolved puzzles of drug delivery and therapeutics and so a burgeoning bough of science. In order to improve the solubility and stability of curcumin,



various studies implying nanocarriers in the form of nanoparticles, lipid-based nanospheres, nanocrystals, liposomes and polymer-based delivery systems were reported (11-13).

However, among the available nanoparticle based dosage forms nanogel, since they efficiently solubilize poorly water soluble drugs and at once offer prolonged release. Nanogels are three-dimensional hydrogel materials in the nanoscale size range formed by crosslinked swellable polymer networks with a high capacity to hold water, without actually dissolving into the aqueous medium. Nanogels can be composed of a variety of naturally occurring polymers, synthetic polymers or a combination thereof. (14, 15, 16)

Our exhaustive search has revealed that till date no study has reported in combination use of curcumin as nanogel for the treatment of psoriasis. In view of this fact, in the present study, an attempt has been made to develop nano gel of curcumin, potential delivery system for psoriasis.

MATERIALS AND METHODS

Plant Materials: The pure drug of '*Curcuma longa* (Curcumin) was obtained as gift sample from Sun pharma pharmaceutical industry, Vadodara, India' that contains curcumin not less than 95% and PAMAM Dendrimer was purchased from Nano synthon, USA.

Chemicals: Sodium alginate, calcium chloride, acetic acid, sodium hydroxide, carbopol 934, methyl paraben, propyl paraben, propylene glycol, triethanolamine, finasteride (all were procured from Hi-Media laboratories, Mumbai, India), testosterone (Loba Chemie Pvt Ltd., Mumbai, India), and carboxymethylcellulose (Sigma-Aldrich) were used. All chemicals and solvents used were of analytical reagent grade.

TLC Profile: TLC of curcumin was performed on precoated silica gel G plate (stationary phase) using mixture of n-hexane and ethyl acetate (7:3), chloroform: methanol (95:5) as solvent system (mobile phase); ninhydrin reagents were used for detection and the Rf value of separated spot were calculated; the thin layer chromatography was performed and intense spot was detected. (17)

UV Spectra of the Drug: Accurately "1 mg of drug was taken in 10 ml volumetric flask and then dissolved in 1-2 ml methanol and final volume was make up with water up to 10 ml and drug solution was scanned in range of 200-600 nm" by Syntonic double beam spectrophotometer and absorption maxima was noted.

NMR Spectroscopy: NMR is a spectroscopic technique to observe local magnetic fields around atomic" nuclei. NMR (JEOL 400 MHz spectrometer, 1999, CDRI Lucknow), the : curcumin was solubilized in deuterated methanol and analyzed at 300 MHz. (18, 19)

Formulation and Development:

I) Method of Preparation of Gel Base (20, 21)

- Firstly 125mg curcumin was dispersed in 0.9 ml methanol and PAMAM dendrimer G4 was added slowly with inter mediate shaking until clear solution was obtained and total amount of dendrimer added was recorded.
- Then solubilizate was subjected from evaluation of UV spectra, zeta potential and drug encapsulation.

II) Gel formulation

- Different concentration of HPMC was taken for the preparation of gel base and then gel base of appropriate consistency was selected.
- Amongst gel base selected solubilizate was added and subjected for further evaluation.

Table 1: Formulation of 2% Gel Base

S. No.	Ingredient	HP01	HP02
1	Curcumin (mg)	125	125
2	Dendrimer (μ m)	10	10
3	Methanol	q.s	q.s



Table 2: Formulation of Curcumin Containing Dendrimer Gel

S. No.	Ingredient	HP01	HP02
1	Curcumin (%)	5	5
2	Dendrimer(μ L)	10	10
3	HPMC (g)	1.0	0.5
4	Methanol	q.s	q.s



Figure 1: Curcumin containing Gel

Evaluation of Dendrimer Gel Containing Curcumin (22-25)

Physical Properties of Gel: Physical properties of gel were observed visually.

pH Measurement: pH measurement was performed by calibrating pH meter (Electrode), firstly calibrate standard pH solution of 4.1, 7.0 and 9.0, further the gel solution was measured.

Spreadability Test: A sample of 0.5 g of each formulation was placed with in a circle having 1cm diameter pressed between two slides (divided into square of 5mm sides) and left for about minutes, where no more spreadability was expected, and increase diameter due to spreading of the test formulation was notes.

Drug Content Study: A particular amount of produced gel was dissolved in 100 ml of pH 6.8 phosphate buffer solution. To achieve full drug solubility, the volume flask containing gel solution was agitated for 2 hours using a mechanical stirrer. This solution was filtered through a Millipore filter (0.45 μ m), and drug absorption was measured using a UV Spectrophotometer (254 nm) with phosphate buffer solution pH 6.8 as a blank.

In-vitro Release Study: In vitro drug release studies were performed by immersing the skin in an appropriate amount of buffer solution and hanging the skin following application of the formulation. Containment containing formulation was kept in place by stirring with a magnetic bead. 1ml of sample was taken at predetermined intervals. An equivalent volume of buffer was replenished from the receptor compartment. After adequate dilution, the sample was spectrophotometrically examined for drug concentration at 425nm.

Stability study: The selected formulation was evaluated for stability study, stored at 4 °C with 75 % relative humidity tested for 2 months. Analyzed for their physical parameter, drug content.

PHARMACOLOGICAL SCREENING

Animals: In the animal room of Rameshwaram Institute of Technology & Management, Lucknow, weighing 50-60 gm, 25-35 gm, experiment was performed on adult male mice. They were kept in standardized condition (21-24 °C temperature and 12 hrs/12 / hrs light / dark cycle) and were fed a normal laboratory diet. The rats were divided into one control, Second Disease control, Third Standard, Fourth Test 1 and Fifth Test 2 with 5 animals in each group after 1 week of acclimatization. The study protocol was approved by the Ethics Committee, Rameshwaram Institute of Technology & Management.

Imiquimod-Induced Psoriasis Models: Mice were kept under specific pathogen-free conditions and provided with food and water ad libitum. All experiments were approved by the animal ethics committee according to Dutch legislation on animal experiments. Mice at 8 to 11 wk of age received a daily topical dose of 62.5 mg of commercially available IMQ cream (5%) (Aldara; 3M Pharmaceuticals) on the shaved back and the right ear for 5 or 6 consecutive days, translating in a daily dose of 3.125 mg of the

active compound. This dose was empirically determined to cause most optimal and reproducible skin inflammation in mice. Control mice were treated similarly with a control vehicle cream (26, 27).

Procedure- Depicts the experimental design with a dosing schedule in experimental mice. Psoriasis-like skin lesions were induced in BALB/c female mice by topical administration of IMQ. Mice were divided (G=3) as control group (CG), Tested group (TG), standard group (SG; 1% Soriafit cream). IMQ applied on the skin in all the groups except CG. were applied daily from the fifth day of IMQ administration for four consecutive days.

Body weight were measured on every alternate day, (0th), 2nd, 4th, 6th and 8th-days. At 0th, 2nd, 4th, 6th and 8th day, photographs of individual constraints were taken, and data was collected in the form of radar graph. Dorsal skin tissues were harvested on the final day of the study for biochemical, immunohistochemical and histological investigations. Anti-psoriatic effect of LO was investigated by using following equation:

$$\text{Anti-psoriatic activity (\%)} = \frac{\text{value of toxin group- treated group}}{\text{value of toxin group- control group}} \times 100$$

A carrageenan-induced paw edema test was performed according to the modified methods described earlier (28). Wistar rats were divided into different groups of eight animals each based on basal paw volume (0 h), measured using Plethysmometer (Ugo Basile, Italy). Inflammation was induced by the subcutaneous injection of λ -Carrageenan (0.1 ml of 1% a solution in normal saline) into the plantar side of the left hind paw. The paw was marked with ink at the level of the lateral malleolus, and the volume was measured up to the mark at 1, 2, 3, 4, and 5 h after carrageenan injection for all the animals. Further, animals were treated orally with SBKT (Sea buckthorn oil) [100 mg/kg p.o. + 40 μ l/paw topical application (T.A.)] or INDO at 10 mg/kg (p.o.), 1 h before carrageenan challenge. Paw edema was calculated by subtracting the 0-h (basal) paw volume from the respective paw volumes at 1,2, 3, 4, and 5 h. The anti-inflammatory activity (%) was calculated for each animal using the following formula:

$$[\text{Mean paw edema of control animals (ml)} - \text{paw edema of each test animals (ml)}] / [\text{Mean paw edema of control animals (ml)}] \times 100.$$

Histopathological Examination: The longitudinal sections of the skin fixed in 10% formalin embedded in paraffin and cut into 5 μ m thick section using a microtome. Sections are mounted on glass slides using standard techniques. The sections are stained with Haematoxylin-eosin and are examined under a microscope using 10x and 40x magnifications and photographed under a light microscope equipped for photography (29).

Statistical Analysis: Results were expressed as Mean \pm SEM. The data was analyzed using one way analysis of variance (ANOVA) followed by Dennett's test and P values < 0.01 were considered as Significant. (30)

RESULTS AND DISCUSSION

Thin Layer Chromatography: TLC "plate showing the 5 spots with different colour with different R_f value in 0.5% vanillin in dil. H_2SO_4 in solvent system" (n-hexane: ethyl acetate: few drops of formic acid) in a ratio of 7:3: few drops of formic acid.



Figure 2: Chromatogram of TLC Curcumin

U.V. Spectrophotometry of Curcumin: The maximum absorbance of Curcumin reorders in methanol solution, which shows the highly characteristic intense peak at 215, 374, 398. The absorption spectrum of Curcumin is the drug sample was almost 99% pure as analyzed by official method is shown in **Figure 3**.

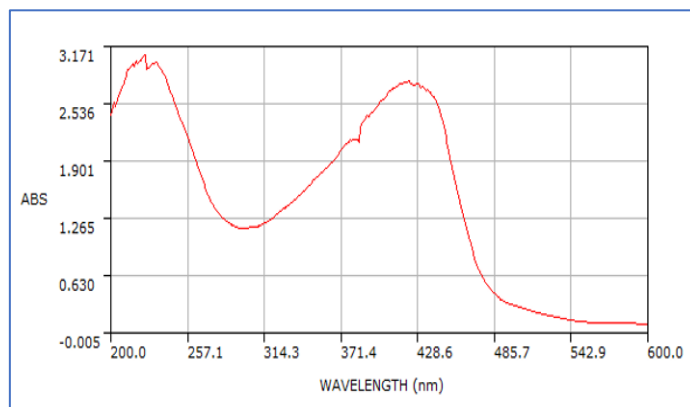


Figure 3: U.V. Spectrum of Curcumin

NMR Spectra of Curcumin: NMR spectra of curcumin was mentioned in figure 4.

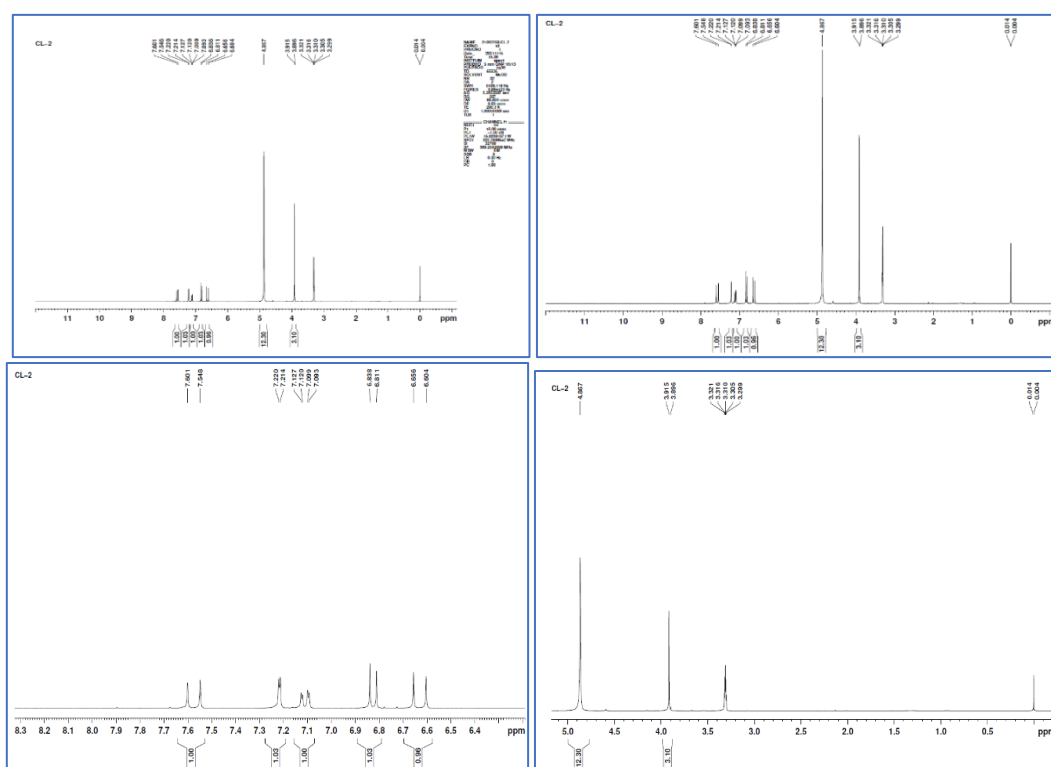


Figure 4: NMR spectra of Curcumin

Evaluation of Curcumin Gel

Physical Appearance: Curcumin gel formulations were light green viscous preparations with a nice uniform texture. Table 3 depicts the ointment's physical appearance.

Table 3: Physical Appearance

Formulations	Homogeneity	Colour	Consistency	pH
HP01	Excellent	Radish Yellow	+++	6.36
HP02	Good	Radish Yellow	++	6.45



Extrudability and Spreadability: After forming the gels, they were placed in collapsible tubes. The formulation's extrudability has been evaluated. Table 4 shows the spreadability of gel on the skin surface of human volunteers.

Drug Content Analysis: The mean percent drug content in dendrimer formulations (HP01-HP04) was found to be respectively 90.19 and 93.21%.

Table 4: Extrudability and Spreadability of Gel

“Formulation”	“Extrudability”	Spreadability	% Drug Content
HP01	“Easily Extrudable”	Good	90.19±2.65
HP02	“Easily Extrudable”	Excellent	93.21±2.54

In-vitro Release Rate: Curcumin loaded gel was subjected to in vitro drug release by using the Franz diffusion cell. The cumulative % of drug release was calculated for curcumin gel. Prepared curcumin gel showed good release. Both are the main requirement for dermal application because it can be useful to improve drug penetration and sustained release to release drug content slowly from curcumin loaded gel for long duration. Cumulative % of drug release for curcumin laded gel is shown in Figures 5.

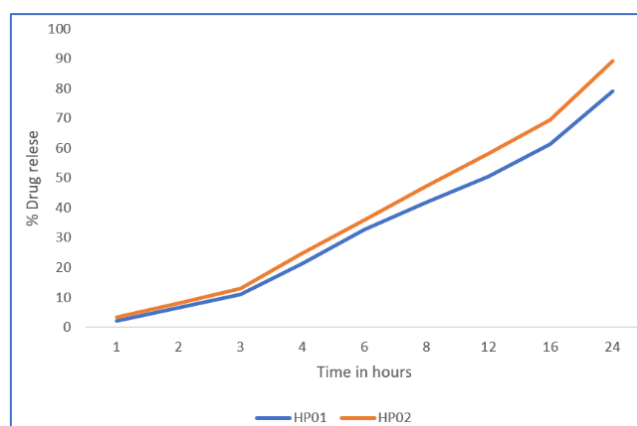


Figure 5: Cumulative percentage drug release

Stability Study: The stability studies of dendrimer were performed at $5^{\circ} \pm 2^{\circ} \text{C}$ and $25^{\circ} \pm 2^{\circ} \text{C} / 60 \pm 5\%$ Relative Humidity (RH) for 2 months as per modified ICH guidelines. The optimised formulation (HP02) was visually examined for any precipitation, drug content, pH for 2 months every 30 days.

Table 5: Stability data for optimized formulation (HP02) at $25 \pm 2^{\circ}\text{C} / 60 \pm 5\%$ RH at short term accelerated condition

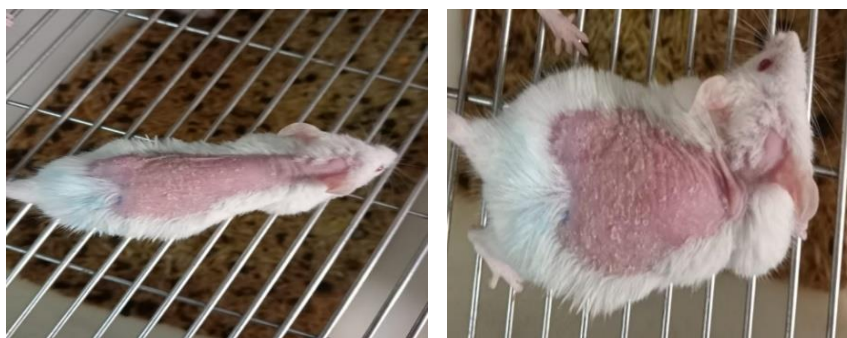
Month	HP02		
	0	1	2
Appearance	Radish Yellow	Radish yellow	Radish Yellow
pH	6.35	6.33	6.31
Drug content	93.31%	9.30%	94.28%

PHARMACOLOGICAL SCREENING

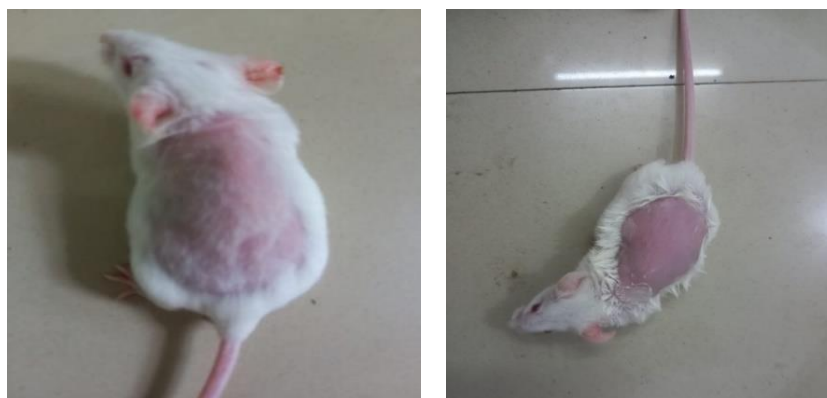
Induction Of Psoriasis: IMQ-induced skin inflammation in mice phenotypically resembles psoriasis. Erythema, scaling, and thickness of the back skin was scored daily on a scale from 0 to 4. Scores are measured the result are summarized as follows.



Control



Disease



Treatment

Standard

Figure 6: Induction of Psoriasis

Table 6: Irritation of curcumin gel and its major constituent.

Sample	Base	Curcumin gel	Standard
Result	Non-irritant	Slight irritant	Non-irritant

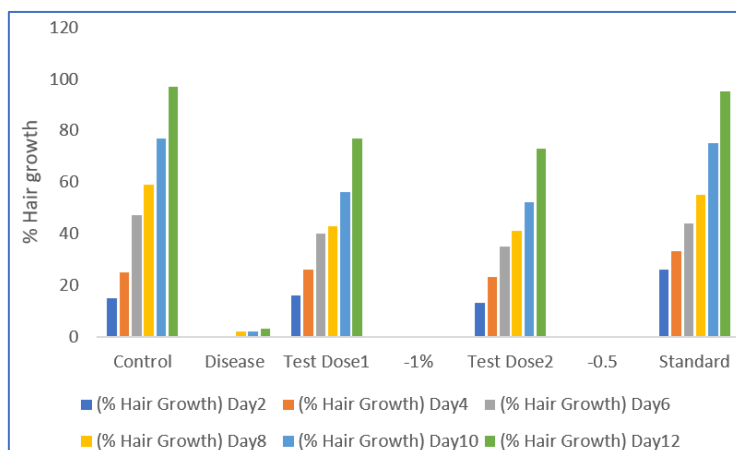


Figure 7: Hair growth of treating psoriasis in all groups of animals

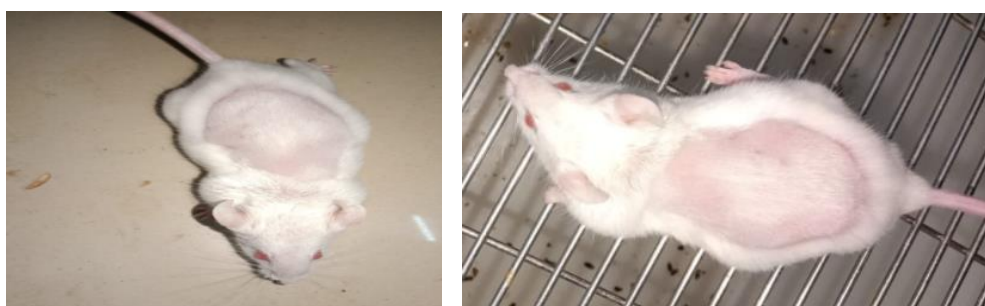


Figure 8: Hair growth in animal

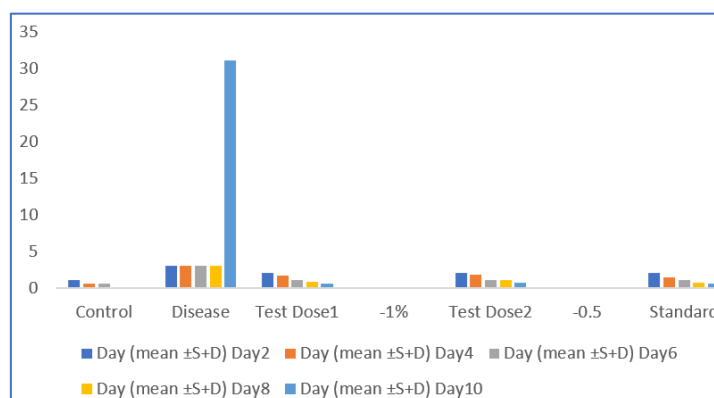


Figure 9: Represented changes in the erythema of treating psoriasis in all groups of animals

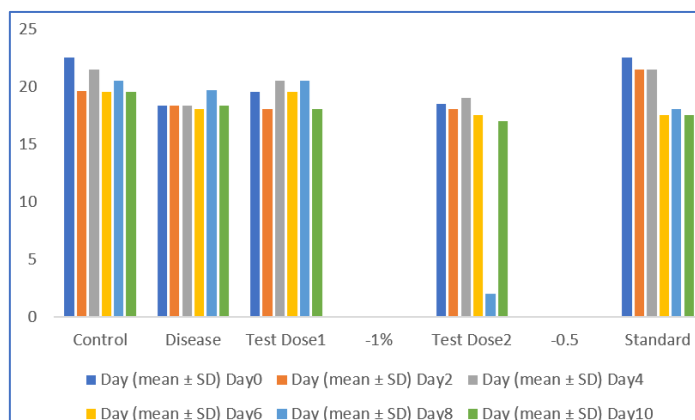


Figure 10: Represented change body weight (gm) in all groups of animals

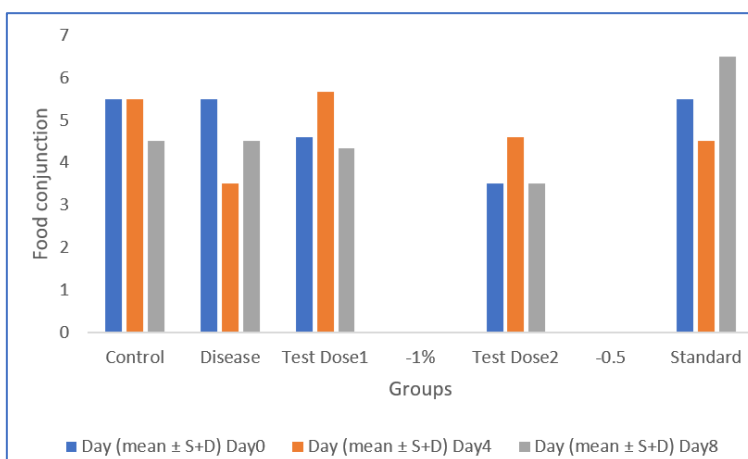
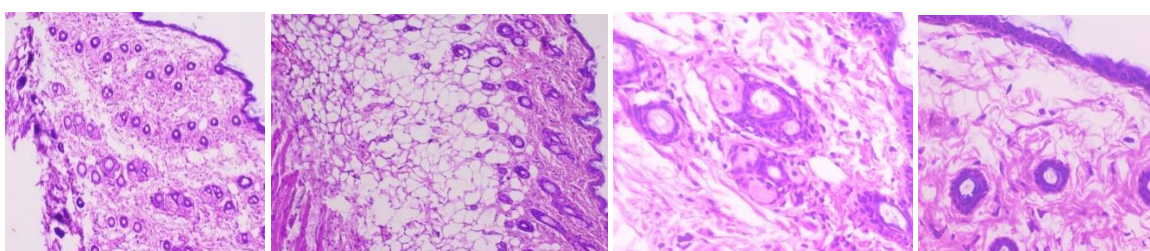
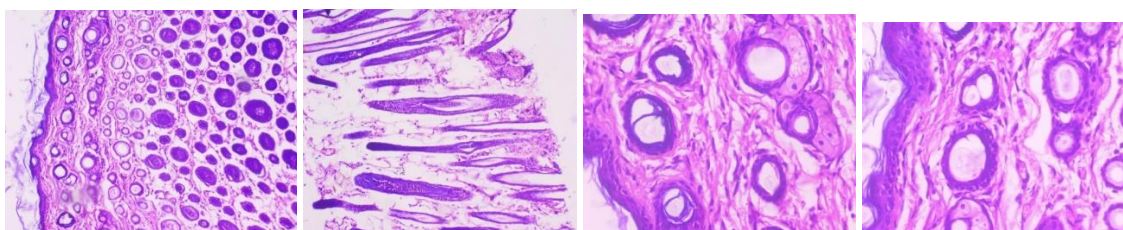


Figure 11: Represented food conjunction (gm) in all groups of animals

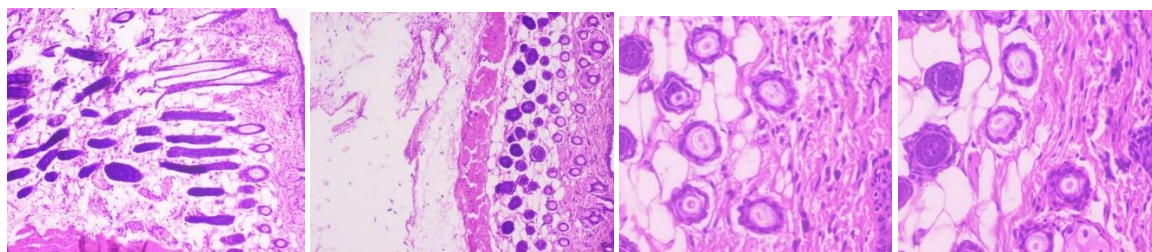
HISTOPATHOLOGICAL EXAMINATION



Control Group



Test Group



Standard Group

Figure 12: Histopathological Examination of Rat Skin

The Curcumin containing gel showed increased keratosis percentage and decreased epidermal thickness regions. The standard drug mometasone showed the increased orthokeratotic and decrease epidermal thickness regions. Respectively in comparison to normal and imq treated skin. At present, psoriasis remain pathology for which no complete cure is available. Corticosteroid treatment, which lead to a quick remission of symptoms, must be used for a short term because of its serious adverse effects. Therefore, it thus remains as a valuable therapeutic objective to find out a compound with some of the beneficial properties of the anti-psoriatic drugs but without their deleterious effects. In this aspect, the curcumin gel formulated show prominent anti-psoriatic activity with $53 \pm 1.5\%$ of keratosis and $10 \pm 0.32\%$ epidermal thickness activity in mice skin which is comparable to the standard (clobetasol).

CONCLUSION:

To prevent systemic toxicity, the current study looked into the topical use of Curcumin-loaded dendrimer gel for the treatment of psoriasis. The lead dendrimer gel formulation had optimal particle size and a high drug content. Curcumin gel can also promote curcumin stability, according to in vitro antifungal investigations. Furthermore, in vitro drug release experiments indicated that curcumin gel can regulate topical curcumin administration and enhance drug localisation at the skin problematic site. The most promising curcumin loaded nano gel because of its psoriasis at low concentrations in vitro. It might be suitable for the topical long-term treatment of psoriasis. Used as a basic emollient, it might enhance the healing process and prolong the symptomless interval in psoriasis. Finally, the findings indicated that curcumin gel has a significant therapeutic potential in a topical approach to the treatment of psoriasis. However, more research and testing using an appropriate animal model are necessary to prove the superiority and safety of the proposed curcumin gel over existing systemic treatment.

REFERENCES:

1. Michelle AL, Anne MB, James GK. Pathogenesis and therapy of psoriasis. *Nature* 2007; 445: 866-72.
2. Eman SEL, Amna MM, Abeer MK, Doaa GH. Nanoemulsion gel of nutraceutical co-enzyme q10 as an alternative to the conventional topical delivery system to enhance skin permeability and anti-wrinkle efficiency. *Int J Pharm Pharm Sci* 2017; 9: 207-11.
3. Sanaa EG, Maha F, Basma M, Fatma EZ. Betamethasone dipropionate gel for the treatment of localized plaque psoriasis. *Int J Pharm Pharm Sci* 2017; 9: 173-82.
4. Sandhiya V and Ubaidulla U: A review on herbal drug loaded into pharmaceutical carrier techniques and its evaluation process. *Future J Pharm Sci* 2020; 6: 1-16.
5. Bhatt D, Jethva K, Patel S and Zaveri M: Novel drug delivery systems in herbals for cancer. *World J Pharm Res.* 2016; 5: 368-378.
6. Yunus P, Omid F, Stephen LA, Muhammed M, Alexandra EB, Thomas PJ, et al. Evidence of curcumin and curcumin analogue effects in skin diseases: a narrative review. *J Cell Physiol.* 2018; 234(2): 1165-78.
7. Vollono L, Falconi M, Gaziano R, et al. Potential of Curcumin in Skin Disorders. *Nutrients.* 2019;11(9):2169. <https://doi.org/10.3390/nu11092169>.
8. Nardo VD, Gianfaldoni S, Tchernev G, et al. Use of Curcumin in Psoriasis. *Open Access Maced. J Med Sci.* 2018;6(1):218-20. <https://doi.org/10.3889/oamjms.2018.055>.
9. Varma SR, Sivaprakasam TO, Mishra A, Prabhu S, Rangesh RM. Imiquimod-induced psoriasis-like inflammation in differentiated Human keratinocytes: Its evaluation using curcumin. *Eur J Pharmacol.* 2017; 813: 33-41. <https://doi.org/10.1016/j.ejphar.2017.07.040>.
10. Ferreira VF and Pinto AC: A fitoterapia no mundo atual. *Química Nova* 2010; 33: 1829. Vickers A and Zollman C: Herbal medicine. *Br Med J* 1999; 319: 1050-1053.
11. Ali SI, Gopalakrishnan B, Venkatesalu V: Pharmacognosy, phytochemistry and pharmacological properties of *Achillea millefolium* L.: A review. *Phytother Res* 2017; 31: 1140-1161.



12. Xu R, Luo G, Xia H, He W, Zhao J, Liu B, Tan J, Zhou J, Liu D and Wang Y: Novel bilayer wound dressing composed of silicone rubber with particular micropores enhanced wound re-epithelialization and contraction. *Biomaterials* 2014; 40: 1–11.
13. Avasathi, V.; Pawar, H.; Dora, C. P.; Bansod, P.; Gill, M. S.; Suresh, S., A novel nanogel formulation of methotrexate for topical treatment of psoriasis: optimization, in vitro and in vivo evaluation. *Pharm Dev Technol* 2016, 21 (5), 554-62.
14. Richa; Roy Choudhury, A., Synthesis of a novel gellan-pullulan nanogel and its application in adsorption of cationic dye from aqueous medium. *Carbohydr Polym* 2020, 227, 115-291.
15. Adi AC.; Christanto C.; Rachmawati H.; Adlia A. vitamin e-based folic acid nanoemulsion: formulation and physical evaluation for oral administration. *pharm nanotechnol* 2019, 7 (4), 304-313.
16. Sinha, P.; Srivastava, S.; Mishra, N.; Singh, D. K.; Luqman, S.; Chanda, D.; Yadav, N. P., Development, optimization, and characterization of a novel tea tree oil nanogel using response surface methodology. *Drug Dev Ind Pharm* 2016, 42 (9), 1434-45.
17. Sankar A.; Chandrashekar AK.; Durga, S. Formulation and stability Evaluation of Diclofenac Sodium Ophthalmic Gel. *Indian J. Pharm. Sci.* 2005, 473-476
18. Pandey, A.; Jagtap, J. V.; Polshettiwar, S. A.; Formulation and evaluation of in-vitro antimicrobial activity of gel containing essential oils and effect of polymer on their antimicrobial activity. *Int J Pharm PharmSci* 2011, 3, 234-237
19. Pawar, D. P; Shamkumar, P. B.; Formulation and evaluation of herbal gel containing lantana camara leaves extract. *Asian J Pharm Clin Res.* 2012, 6, 122-124
20. Waghmare, N.; Waghmare, P.; Wani, S. et al; Development of Isotretinoin Gel for the Treatment of Acne Vulgaris. *Research Journal of Pharmaceutical, Biological and Chemical Sciences* 2011, 2, 220-230
21. Jambaninj, D.; Suleman, S.; Gillani, S. W.; Technological study of preparing gel from semi-solid extract of *Cacalia hastata* L. J. *Adv. Pharm. Tech. Res* 2012, 3, 25-29
22. Das, K.; Dang, R.; Machale, M. U.; Formulation and Evaluation of A Novel Herbal Gel Of Stevia Extract. *Iranian Journal of Dermatology* 2010, 12, 117-122.
23. Goyal, S.; Sharma, P.; Ramchandani, U.; et al Novel Anti-Inflammatory Topical Herbal Gels Containing *Withania somnifera* and *Boswellia serrata*. *International Journal of Pharmaceutical & Biological Archives* 2011, 2, 1087-1094.
24. Aslani A, Zolfaghari B and Fereidani Y: Design, formulation and evaluation of a herbal gel contains melissa, sumac, licorice, rosemary and geranium for treatment of recurrent labial herpes infections. *Dent Res J Isfahan* 2018; 15(3): 191-200.
25. Tembhare E, Gupta KR and Umekar MJ: An approach to drug stability studies and shelf-life determination. *Archives of Current Research International* 2019; 19(1): 1-20.
26. Thappa DM and Munisamy M: Research on psoriasis in India: where do we stand. *Indian J Med Res* 2017; 146(2): 147-49.
27. Patel SC, Gadade DD, and Rathi TB: Design development and evaluation of Herbal Gel for treatment of Psoriasis. *JIPBS* 2015; 2(1): 72-87.
28. Krueger J and Bowcock A: Psoriasis pathophysiology: current concepts of pathogenesis. *Ann Rheum Dis* 2005; 64(2): 30-36.
29. Nazeer M, Ravindran S, Gangadharan G and Criton S: A survey of treatment practices in management of psoriasis patients among dermatologists of Kerala. *Indian Dermatol Online J* 2019; 10: 437-40.
30. Kent S, Kristen MS, Marina RY, Kevin MY, Liselotte J, Gil Y. Mouse model of imiquimod-induced psoriatic itch. *Pain.* 2016; 157: 2536–43.

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