

Formulation and Evaluation Of Herbal Gel Containing Lantana Camara For Management Of Acne Vulgaris

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ABSTRACT

The present research was aim to formulate and evaluate the herbal gel containing Lantana Camara leaf extract. Extracts of plant were incorporated into a gel base and evaluated for its physicochemical properties such as pH, viscosity, spreadability etc. The physicochemical evaluation of the developed formulation showed no lumps, had uniform colour dispersion and from any fibre and particle. It was also observed to have easy washability and good spreadability. The antimicrobial activity for Lantana Camara using disc diffusion method was carried out. The antibacterial study of the developed formulation showed dose/concentration proposed inhibitory activity against Staphylococcus aureus and Staphylococcus epidermis. The results concluded that the extract of Lantana Camara is an appropriate formulation for the topical therapy of acne vulgaris

Keywords: *Lantana Camara, Herbal gel, Acne vulgaris Evaluation test, Antimicrobial activity.*

1. INTRODUCTION

Lantana Camara comprises about 150 varieties across 50 countries. It is evergreen shrub commonly called as wild sage and lantana weed. Different species of lantana have been used for treatment and medical problems for many years, such as ulcers, wounds, tumours, eczema. Various plant components have been documented for their pharmacological properties, such as anti-lymphocytic and immunosuppressive, hepatoprotective, antimotility, cytotoxic in-vivo and anti-filarial activity¹. On Earth, there are 2,00,000 to 5,00,000 species of plants. India is the source of numerous medicinal plants. Sometimes referred to as wild/red sage, Lantana Camara linn (verbenaceae). The literature survey shows that flavonoids, triterpenoids, tannins and saponin compounds have been used for plants such as berberis asistata,

euphorbia prostate, and santlaum album. It has been found that the antagonists of cyclic AMP phosphodiesterase are some flavonoids. It has the capacity to inhibit the function of platelets. Flavonoids have been shown to inhibit ascorbic acid oxidation by chelate formulation with metals, protecting epinephrine by inhibiting o-methyl transferase that preserves capillary tonus, inhibiting platelet aggregation². It has been demonstrated that the leaves of lantana camara have anti-hemorrhoidal and anti-inflammatory activity. The plant Lantana Camara Linn (Verbenaceae) is known in ayurveda and siddha as a potent medicine for a variety of ailments. The plant has been used in many parts of the world to treat a wide range of disorders, especially in folk medicine for tumours and cancer. A tea prepared from the flowers and leaves is used against fever, flu and stomach ache³⁻⁴. Microwave extraction method has proven to be more powerful and effective than its conventional counterpart, the Soxhlet extraction method. The Soxhlet extraction, which is a common technique, is a continuous solvent extraction method.⁵⁻⁹ Routine solvent extractions of soils, sediments, sludge, polymers and plastics, pulp and paper, biological tissues, textiles and food samples are conducted using extraction systems. In contrast with the Soxhlet extraction, studies have shown that microwaves use a lower volume of solvent and sample and perform extraction at a much faster rate. Because of ADME failure, it is important to conduct docking studies before pharmacological activity, as it is simple to predict the probable pharmacological activity by receptors with the help of phytoconstituent structures¹⁰⁻¹⁹. In the discovery of effective medicines for prevention and treatment, an outbreak of coronavirus disease (COVID-19) caused by the novel extreme acute respiratory syndrome coronavirus-2 (SARS-CoV-2) poses an unprecedented obstacle. Given the rapid pace of scientific research and clinical data provided by the large number of people who are rapidly infected with SARS-CoV-2, clinicians need reliable evidence of good medical care for this infection, as it is simple to perform in-silico analysis in the initial stage with the aid of molecular docking software with help of chemical constituents structure of any medicinal plant. It is necessary to enhance both enzymatic stability and membrane permeation in the formulating drug delivery system for protein and peptide drugs. Soon, someday, you might be making your own drugs at home. That is because researchers have adapted a 3D printer from basic, readily available medicinal active agents fed into a drug delivery system²⁰⁻²⁴. Emergence of resistant strains of pathogenic microorganism has also continued to raise a major health concern about the effectiveness of many medications, most notably antibiotics in current use. In human being, skin is the most susceptible part for entering of various pathogens, microorganisms and spreading of diseases. In general, acne vulgaris originates at puberty stage due to hormonal changes which ultimately results in changes in pathophysiologic factors. For many years, antibiotics have been used to treat acne vulgaris. However, antibiotic resistance has been increasing in prevalence within the dermatologic setting. The development of antibiotic resistance including the specific nature of the relationship of bacteria to antibiotics, how the antibacterial is used, host characteristics, and

environmental factors. To overcome the problem of antibiotic resistance, medicinal plants have been extensively studied as alternative treatments for diseases. Many medicines are currently available for the treatment of microbial infection, but most of them are becoming abortive because of the microorganism antimicrobial resistance. To address antimicrobial resistance and side effects, there is an enormous need for the discovery of novel antimicrobial agents. So our aim and objective to develop safe and effective herbal formulation for effective management of acne²⁵⁻³⁷

MATERIALS AND METHODS

Plant Materials

Leaves of Lantana Camara were collected from the residential areas of Islampur, Sangli, Maharashtra, India.

Preparation of Plant extract

Shade drying was done for almost a month as to avoid chemical degradation due to sunlight. Grinding of the dried material was done, with the aid of a grinder and converted into coarse powder. Extraction of Lantana Camara was done by microwave extraction further filtered and excess solvent present was evaporated and dried extract were collected and subjected for further studies.

Preparation of Herbal gel

In 50 ml of distilled water 1 g of carbapol 934 was dispersed and keeps the beaker aside to swell the carbapol 934 for half an hour and stirring vigorously to mix the carbapol 934 to form a gel. Take a required quantity of methyl parben (0.1 ml) and propyl paraben (0.2 ml) in a 5 ml of distilled water which is where dissolved by heating on water bath. Solution was cooled and propylene glycol (5 ml) was added. Further 1 g extract of lantana camara leaves was mixed to the above mixture and volume made up to 100 ml by adding remaining distilled water. Finally all mixed ingredients were mixed properly to the carbapol 934 gel with continuous stirring and drop wise triethanolamine was added to the formulation for adjustment of skin pH (6.8-7) and then to obtain the gel to required consistency.

Table 1. Formulation table of Herbal gel

Sr. no	Ingredients	Quantity
1	Lantana Camara extract	1 g
2	Carbapol 934	1 g
3	Methyl paraben	0.2 g
4	Propyl paraben	0.1 g
5	Propylene glycol	5 ml
6	Triethanolamine	1.2 ml
7	Distilled water	q.s 100 ml

Evaluation of Herbal Gel

a. Physical Evaluation

Physical parameters such as colour and appearance were checked.

b. Measurement of pH

pH of the gel was measured by using pH meter.

c. Spreadability

The steel blocks used to check spreadability. Spreadability was measured by this method on the basis of the slip and the drug characteristics of the gel put on the ground slide and the excess gel (approximately 2 g) under analysis. The gel was then placed between the slides and 200 g weighted for 5 minutes was placed on the top of 2 slides to expel air to provide a uniform gel film between the slides where excess gel was scrapped off the edges. The time noted by the top slide (in seconds) to cover a distance of 7.5 cm must be noted.

$$S = M.L/T$$

Where,

M = Wt. tied to upper slide

L = Length of glass slides

T = Time taken to separate the slides

Acid value, Peroxide value and Total fatty matter determination

a. Acid value

0.5 gm of gel was taken and dissolved in 10 times of absolute alcohol. It was heated on a hot plate for 5 min and 2 to 3 drops of phenolphthalein indicator was added to it and titrated with 0.1 N KOH until faint pink color appeared.

$$\text{Acid Value} = 56.1 \times \text{Titre value} \times N \text{ of KOH} / \text{Weight of sample.}$$

b. Peroxide value

In a separate 200 mL flask, 5 gm of gel sample of control (base) and formulations, 30 mL of acetic acid and chloroform solution were added and swirled gently. Then 0.5 mL of potassium iodide solution was added with continuous shaking and 30 mL of water was added thereafter. Finally the solution was then titrated with 0.1 M sodium thiosulfate solution with vigorous shaking. End point of titration was noted when yellow color almost disappears. Then 0.5 mL of 1% starch was added and titration was continued with vigorous shaking to release all iodine from chloroform layer, until blue color disappeared.

$$\text{Peroxide value} = S \times M \times 1000 / \text{gm sample}$$

Where,

S = mL of sodium thiosulfate and

M = Molarity of sodium thiosulfate solution.

c. Total fatty matter determination

2 g of gel sample and 20-25 mL of 1:1 dilute HCl was taken into the 200 mL flask, then the solution was heated on a water bath till the solution becomes clear. The sample (aqueous phase) was drawn in a 250 mL separating funnel and then allowed to cool at room temperature. 50 mL of petroleum ether (organic phase) was then added in the funnel and shaken and left for separation to occur. The organic phase was

collected. The above aqueous layer partitioned twice with same quantity of petroleum ether. The organic layers were collectively evaporated to obtain residue which was consequently washed with water. The residue was filtered and sodium sulfate was added to it. The mixture was again filtered, the extract was dried and the content was determined²⁸⁻³².

$$\text{Total fatty matter (\% by mass)} = 100 \times M_1/M_2;$$

Where,

M_1 = mass of residue;

M_2 = mass of sample in gram

Antimicrobial Screening

Antimicrobial activity was evaluated disc diffusion method. The cultures were grown in a nutrient broth and incubated for 24 hr at 37°C. After the time of incubation is over, the O.D. The culture with sterile nutrient broth was set to 0.1 in sterile petri dishes, 20 ml of molten Mueller-Hinton agar medium was poured and allowed to solidify. On the surface of the petri dishes seeded with 0.1 ml microbial suspension (5×10^5 CFU/ml), discs (6 mm diameter) impregnated with gel formulation were put. The plates were kept at 100°C for 30 min. The plates were incubated for 24 hr at 37°C at room temperature. The zone of inhibition was measured after the incubation period³⁸⁻⁴⁴.

2. RESULTS AND DISCUSSION

Evaluation of Herbal gel

All results of different parameters of evaluation are recorded. The physical parameter such as color, appearance, feel on application are observed and shown in Table 2. The color of prepared herbal gels was yellowish green the color of extracts was brown and yellow. Appearance of gel was translucent and it was smooth on application. So it shows significant physical evaluation parameters. The subjective properties mention in Table 2 such as consistency was good and texture of prepared herbal gel was found to be smooth. All the prepared herbal gel formulations show desirable spreadability values.

Table 2. Physicochemical evaluation

Physicochemical parameter	Observation
Colour	Yellowish green
Odour	Characteristic
Consistency	Smooth
pH	6.7
Spreadability (seconds)	9 gm.cm/ sec

Acid value, peroxide value and total fatty matter determination

Acid value, peroxide value and total fatty matter for the base and formulation kept at different storage conditions were observed for 30 days and the values for base and formulations were found within the range. Acid value was found to be in the range of 2.38 to 2.90, peroxide value was found to be in the range of 1.65 to 1.84 and total fatty matters were found to be in the range of 15.09 to 15.2 for the formulation and base kept at different storage conditions for 30 days. Data of acid values of the formulations and base were found to be significant ($p < 0.05$) during one month of stability study. Peroxide value data in formulation at 8°C and 40°C were found to be significant ($p < 0.05$).

Antimicrobial activity of herbal gel

The prepared formulations and control were screened for their antibacterial activity by disc diffusion method. It was tested on nutrient medium against *S. aureus* and *E. epidermis*. The activity was determined by measuring the diameter of zone of inhibition recorded. The plates were inoculated with test cultures and were incubated. The next day the plates loaded with prepared formulations. After 24 hr of incubation, the test determined the efficacy of the product in terms of zone of inhibition of the organism.

Table 3. Evaluation of antimicrobial activity by disc diffusion method

Samples	Zone of inhibition in mm	Bacterial species
Lantana Camara extract	10	<i>Staphylococcus aureus</i>
Leaf extracts as gel	16	
Lantana Camara extract	12	<i>Staphylococcus epidermis</i>
Leaf extracts as gel	19	

3. CONCLUSION

It is concluded, on the basis of the results obtained in the present analysis, that the herbal formulation of Lantana Camara extracts gel shows satisfactory physicochemical parameters. Herbal cosmetic products are assumed to be safe for longer periods of time. However, quality control for efficacy and safety of herbal cosmetic products is of paramount importance; and quality control tests must therefore be carried out for these preparations. Topical application of gels at pathological sites offer great advantages in a faster release of a drug directly to site of action as compared to cream and ointment. Nowadays, gels have been widely used as a vehicle for topical delivery of drugs. Extracts of plants and herbs with specific medicinal properties can be incorporated in this dosage form as active ingredients in order to additional benefits. Antimicrobial activity against *Staphylococcus aureus* and *Staphylococcus epidermis* was demonstrated by the antibacterial study results of the formulated topical gel. A study on the effects of formulated gels on bacterial strains has shown that further studies are needed to confirm the role of each of these phytoconstituents on antimicrobial activity. Thus, our research shows that herbal gel have good antimicrobial activity.

4. REFERENCES

1. Bairagi S, Pathan I, Nema N. Analgesic and Anti-Inflammatory Activity of Crude Leaf and Bark Extract of *Lantana Camara*. *Marmara Pharm J*. 2017; 21(4): 810-817.
2. Sharma P, Shrivastava B, Sharma GN, Jadhav HR: Phytochemical and pharmacological profile of *lantana camara L*: An overview. *J Adv pharm Educ Res*. 2013; 3(4): 294-305.
3. Prabhu P, Ravichandran S, Manikgantan E, Priyanka, Vijayakumar P, Nagalakshmi. Molecular effect of *lantana camara* leaves against Dengue vector *aedes aegypti*. *Int J Pharm. Technol*. 2019; 11(1): 3164-31656.
4. Dange V, Shid S, Patil S, Vambhurkar G, Bhutkar M. Formulation and evaluation of novel herbal gel by using lemongrass oil. *Res. J. Pharma. Dosage Forms and Tech*. 2019; 11(12): 67-70.
5. Yadav A, Mohite S. A Brief review: Microwave chemistry and its applications. *Res. J. Pharma. Dosage Forms and Tech*. 2020; 12(3): 191-197.
6. Yadav A, Mohite S, Rajput M, Suryawanshi V, Birajdar R, Patil M, Antioxidant activity of *Psidium guajava* leaf extracts. *Res. J. Pharma. Dosage Forms and Tech*. 2020; 12(3): 159-161.
7. Suryawanshi V, Yadav A, Birajdar R, Jagtap N, Vambhurkar G, Patil P. Optimization of ayurvedic herbal medicine by nanoformulation. *Asian J. Res. Pharm. Sci*. 2019; 9(1): 55-56.
8. Yadav A, Mohite S. Cancer- A Silent Killer: An Overview. *Asian J. Pharm. Res*. 2020; 10(3): 213-216.
9. Chitruk A, Yadav A Rode P, Mohite S, Magdum C. Synthesis and toxicological evaluation using brine shrimp lethality assay of Novel 1,2,4-triazole derivatives with anticancer activity. *Int. J. Curr. Adv. Res*. 2020; 09(08)(A): 22877-22881.
10. Yadav A, Mohite S. ADME analysis of phytochemical constituents of *Psidium guajava*. *Asian J. Res. Chem*. 2020; 13(5): 373-375.
11. Yadav A, Mohite S. Anticancer activity and In-silico ADMET analysis of *malvastrum coromandelianum*. *International Journal of Pharma Sciences and Research*. 2020; 11(5): 71-73.
12. Honmane P, Yadav A, Singh S, Mohite S. Microwave assisted synthesis of novel benzimidazole derivatives as potent antileishmanial and antimalarial agents. *Int. J. Curr. Adv. Res*. 2020; 09(07)(B): 22742-22746.
13. Yadav A, Mohite S. Anticancer activity and In-silico ADMET analysis of *malvastrum coromandelianum*. *International Journal of Pharma Sciences and Research*. 2020; 11(5): 71-73.
14. Yadav A, Mohite S, Magdum C. Synthesis, characterization and biological evaluation of some novel 1,3,4-oxadiazole derivatives as potential anticancer agents. *Int. j. sci. res. sci. technol*. 2020; 7(2): 275-282.

15. Yadav A, Mohite S. *Green Chemistry approach for Microwave assisted synthesis of some Traditional Reactions. Asian J. Research Chem.* 2020; 13(4): 261-264.
16. Yadav A, Mohite S. *Different Techniques and Characterization of Polymorphism with their Evaluation: A Review. Asian J. Pharm. Tech.* 2020; 10(3): 213-216.
17. Yadav A, Mohite S, Magdum C. *Microwave assisted synthesis of some traditional reactions: Green chemistry approach. Asian J. Research Chem.* 2020; 13(4): 275-278.
18. Yadav A, Mohite S, Magdum C. *Comparative study of conventional and microwave assisted synthesis of some organic reactions. Asian J. Pharm. Res.* 2020; 10(3): 217-220.
19. Rode P, Yadav A, Chitruk A, Mohite S, Magdum C. *Synthesis, anticancer and molecular docking studies of N-(1H-benzimidazol-2-yl-carbamothioyl)benzamide analogues. Int. j. sci. res. sci. technol.* 2020; 7(4): 204-212.
20. Yadav A, Mohite S. *A Review on Novel Coronavirus (COVID-19). International Journal of Pharma Sciences and Research.* 2020; 11(5): 74-76.
21. Yadav A, Mohite S. *A Novel approach for treatment of COVID-19 with Convalescent Plasma. Res. J. Pharma. Dosage Forms and Tech.* 2020; 12(3): 227-230.
22. Yadav A, Mohite S. *In-Silico ADME Analysis of 1,3,4-Oxadiazole Derivatives as CDK9 Inhibitors. International Journal of Chemical Science.* 2020; 4(3): 01-04.
23. Yadav A, Mohite S. *A Review on Zika Virus Infection. Res. J. Pharma. Dosage Forms and Tech.* 2020; 12(4): 245-249.
24. Honmane P, Yadav A, Singh S, Mohite S. *Formulation and Evaluation of Herbal Ointment Containing Eclipta Alba (L.) Extract. Journal of Seybold Report.* 2020; 25(10): 569-577.
25. Yadav A, Mohite S. *Toxicological Evaluation of Psidium guajava Leaf Extracts using Brine Shrimp (Artemia salina L.) Model. Res. J. Pharma. Dosage Forms and Tech.* 2020; 12(4): 198-200.
26. Yadav A, Mohite S. *Homology Modeling and Generation of 3D-structure of Protein. Res. J. Pharma. Dosage Forms and Tech.* 2020; 12(4): 218-224.
27. Yadav A, Mohite S. *Recent Advances in the Ultrasound-Assisted Synthesis of Oxadiazole and Thiazole Derivatives. Res. J. Pharma. Dosage Forms and Tech.* 2020; 12(4): 225-228
28. Yadav A, Mohite S. *An Overview on Ebola Virus Disease. Res. J. Pharma. Dosage Forms and Tech.* 2020; 12(4): 230-235.
29. Yadav A, Mohite S. *Carbon Nanotubes as an Effective Solution for Cancer Therapy. Res. J. Pharma. Dosage Forms and Tech.* 2020; 12(4): 238-241.

30. Yadav A, Mohite S. A Review on severe acute respiratory infection (SARI) and its clinical management in suspect/confirmed novel coronavirus (nCoV) cases. *Res. J. Pharma. Dosage Forms and Tech.* 2020; 12(3): 178-180.
31. Yadav A, Mohite S. Recent advances in protein and peptide drug delivery. *Res. J. Pharma. Dosage Forms and Tech.* 2020; 12(3): 205-212.
32. Honmane P, Yadav A, Singh S, Mohite S. 3D printing technology in pharmaceuticals and biomedical. *World J Pharm Pharm Sci.* 2020; 9(9): 598-609.
33. Bhosale M, Yadav A, Mohite S, Magdum C. Synthesis, molecular docking studies and biological evaluation of 1,3,4-thiadiazole derivatives as antimicrobial agents. *Int. J. Curr. Adv. Res.* 2020; 09(08)(A): 22894-22899.
34. Yadav A, Mohite S. Screening of In-vitro anti-inflammatory and Antibacterial assay of *Malvastrum Coromandelianum*. *International Journal of Pharma Sciences and Research.* 2020; 11(4): 68-70.
35. Chitruk A, Yadav A Rode P, Mohite S, Magdum C. Microwave assisted synthesis, antimicrobial and anti-inflammatory potential of some novel 1,2,4-triazole derivatives. *Int. j. sci. res. sci. technol.* 2020; 7(4): 360-367.
36. 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 Delivery* 2012; 4: 434-442.
37. Patil A, Patil A, Patil AC, Shid SJ, Dange VN, Magdum CS, Mohite SK. Formulation and evaluation of polyherbal anti-acne gel. *Research J. Topical and Cosmetic Sci.* 2019; 11(2): 61-63.
38. Yamini K, Onesimus T. Preparation and evaluation of herbal anti-acne gel. *Int J Pharma Bio Sci.* 2013; 4(2): 956-960.
39. Bhalani U, Shah K. Preparation and evaluation of topical gel of *Nigella sativa* (kalonji). *Int J Res Develop Pharm Life Sci.* 2015; 4(4): 1669-1672.
40. Bhaskar G, Arshia A, Priyadarshini SRB. Formulation and evaluation of topical polyherbal antiacne gels containing *Garcinia mangostana* and *Aloe vera*. *Pharmacognosy Magazine* 2009; 5(19): 93-99.
41. Rajput M. D, Yadav A. R, Mohite S. K. Synthesis, Characterization of Benzimidazole Derivatives as Potent Antimicrobial Agents. *International Journal of Pharmacy & Pharmaceutical Research.* 2020; 17(4): 279-285.
42. Rode P, Yadav A, Chitruk A, Mohite S, Magdum C. Microwave assisted synthesis, toxicological assessment using brine shrimp lethality assay and antimicrobial potential of new series of benzimidazole derivatives. *Int. J. Curr. Adv. Res.* 2020; 09(08)(A): 22900-22905.
43. Yadav A, Mohite S, Magdum C. Preparation and Evaluation of Antibacterial Herbal Mouthwash against Oral Pathogens. *Asian J. Res. Pharm. Sci.* 2020; 10(3): 149-152.