WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 16, 666-695. Research Article ISSN 2277–7105

FORMULATION AND EVALUATION OF HERBAL GEL OF NEEM AND CURRY LEAVES

Vedank Jadhav, Saakshi Kamble, *Shreyash Kamble and Ms. Rini Punathil

India.

Article Received on
30 June 2025,

Revised on 21 July 2025,
Accepted on 10 August 2025

DOI: 10.20959/wjpr202516-37891

***Corresponding Author**
Shreyash Kamble
India.

ABSTRACT

This study focused on the formulation and evaluation of a herbal gel containing neem (Azadirachta indica) and curry leaves (Murraya koenigii) extracts, both known for their potent medicinal and antimicrobial properties. The primary goal was to create a stable and effective topical treatment for various skin conditions. Carbopol 940 was employed as the gelling agent, while other excipients were included to enhance the gel's consistency, stability, and overall effectiveness. The formulated gel underwent a thorough evaluation process, which included testing for its physical properties such as colour, Odor, pH, viscosity, spreadability, and extrudability. In vitro antimicrobial activity was assessed against common skin pathogens like Staphylococcus aureus and Escherichia coli, representing both Gram- positive and Gram-negative bacteria. The evaluation demonstrated that the herbal gel had desirable physicochemical properties, including an appropriate pH for skin application and good viscosity and spreadability, making it easy to apply. The gel also exhibited significant antimicrobial activity, effectively inhibiting the growth of skin pathogens. These results suggest that the combination of neem and curry leaves in a gel formulation could offer an alternative, natural treatment option for skin infections and inflammatory conditions, reducing the need for chemical-based or synthetic topical agents. Additionally, the herbal nature of the gel may reduce the risk of adverse effects commonly associated with conventional treatments, making it suitable for long-term use. Further studies could explore the long-term stability, clinical efficacy, and patient acceptability of this herbal gel formulation.

KEYWORDS: neem, curry leaves, herbal gel, antimicrobial activity.

INTRODUCTION

The Many medical systems, including Ayurveda, and others, as well as regional health customs, are used in India to treat a wide range of illnesses in both humans and animals. Medicinal plants are those that are used for therapeutic purposes. Many active substances, including oils, terpenoids, phenolic compounds, proteins, carbohydrates, and enzymes, which are beneficial in extending life and treating illness, are what give plants their medical value. Antimicrobial properties found in many plants include tannins, essential oils, and other aromatic chemicals. These substances shield the plant from deterioration and microbial invasion.

Since the dawn of human civilization, one of the most significant sources of medications for the treatment of illness has been plants. It is a very old art that has been passed down through the generations to employ plants and herb extracts to heal human illnesses. Researchers studying the many native plants found on the continent are looking into how they might be used in traditional medicine in Africa and other developing nations. In order to support the appropriate use of herbal medicine and ascertain their potential as a source for novel medications, research on medicinal plants is crucial. The rising resistance to many mainstream medicines and the subsequent hunt for novel organic plant compounds provided additional impetus for research into traditional plants and herbs. According to the World Health Organization (WHO), drug-resistant microbes are currently thought to be the cause of 700,000 annual fatalities; if nothing is done, this number might rise to 10 million deaths annually. Globally, 490,000 cases of multi-drug-resistant tuberculosis were reported in 2016. Extended

hospital stays, higher mortality rates, and a greater need for critical care are all consequences of antimicrobial resistance that drive up healthcare costs. Methicillin-resistant Staphylococcus aureus, for instance, has a 64% higher death rate than non- resistant strains of the illness. Antimicrobial drugs are frequently administered without expert supervision, which contributes to their abuse and misuse in humans and animals leading to the emergence of drug resistance bacteria. The WHO notes that attempts to tackle drug-resistant illnesses are being undermined by decreased private investment and a lack of innovation in the discovery of new antibiotics, despite the fact that this is one strategy for combating antimicrobial resistance. As a result, concerns about antibiotic overuse, abuse, and side effects are rising in public awareness.

Plants are one possible source of novel antibacterial compounds. This is due to the fact that, since ancient times, medications and other treatments have primarily been derived from plants. Although very few of the pharmaceutical drugs supplied in the United States are employed as antimicrobials, about 50% of them have botanical origins. India was a leader in the field when it came to the discovery of herbal remedies for a range of illnesses. India used to send a lot of these medicinal herbs to the Arab nations, Greece, Italy, Egypt, and other eastern nations. People's interest in herbal treatments declined as Western therapy advanced. Over two thirds of the world's population still receive their primary medical care from traditional herbal medications.

Azadirachta indica

commonly known as neem, margosa, nimtree or Indian lilac,[3] is a tree in the mahogany family Meliaceae. It is one of the two species in the genus Azadirachta. It is native to the Indian subcontinent and to parts of Southeast Asia, but is naturalized and grown around the world in tropical and subtropical areas. Its fruits and seeds are the source of neem oil. Nim is a Hindustani noun derived from the Sanskrit word *nimba* (न □ □ □ब) refers to the *neem* tree.

The *Azadirachta indica* (neem) is a fast-growing tree that can reach a height of 15–20 meters (49–66 ft), and in rare cases, 35–40 meters (115–131 ft). It is an evergreen tree, although it sheds many of its leaves during the dry winter months. The branches are wide and spreading. The fairly dense crown is roundish and may reach a diameter of 20–25 m (66–82 ft). The opposite, pinnate leaves are 20–40 cm (8–16 in) long, with 20 to 30 medium to dark green leaflets about 3–8 cm (1+1⁄4–3+1⁄4 in) long.[7] The terminal leaflet often is missing. The

petioles are short.[8]

Murraya koenigii

commonly known as Curry leaf or Karipatta or sweet neem leaves which belongs to family Rutaceae, it is a widely distributed, aromatic shrub or tree that can reach a height of 6 m and a diameter of 15-40 cm. It has a short trunk, thin, smooth bark that is gray or brown, and a dense, shaded canopy with four crowns. It is found virtually everywhere on the Indian subcontinent. The bark of Murraya koenigii is grey in colour with longitudinal striations and white bark beneath it. The leaves are bipinnately compound, 15-30 cm long, with 11-25 leaflets alternately arranged on the rachis, 2.5- 3.5 cm long, ovate lanceolate with an oblique base. The flowers are bisexual, white, funnel-shaped, sweetly scented, stalked, complete, ebracteate, and regular, with an average diameter of 1.12 cm for fully opened flowers. The terminal cymes each bear 60-90 flowers. The margin is irregularly creatate, and the petioles are 2-3 mm long. Fruits have glands and are ovoid to subglobose, wrinkled, or rough. It is 2.5 cm long and 0.3 cm in diameter, and when it ripens, it turns purplish black. Fruits typically have two seeds. The seeds are usually green in colour, measuring 11 mm in length and 8 mm in diameter, with a maximum weight of 445 mg.

1.2.Neem (Azadirachta indica): Phytochemistry and Pharmacological Properties


NEEM (Azadirachta indica) commonly known as Neem, had been revered in Ayurvedic medicine for its broad-spectrum therapeutic properties. Almost every part of the tree — leaves, bark, seeds, and oil — had been used medicinally.

Phytochemistry

Neem was rich in a variety of active compounds, including.

- Nimbin – Known for its anti-inflammatory and antifungal actions.

- Azadirachtin – A potent insect repellent and antimicrobial agent.
- Nimbidin – Exhibited anti-inflammatory, antibacterial, and spermicidal properties.
- Quercetin – A bioflavonoid with strong antioxidant and wound-healing potential.
- Gedunin and Salannin – Contributed to antimalarial and antifungal effects.

Pharmacological Properties

Neem had demonstrated the following actions.

- Antibacterial and antifungal: Inhibited the growth of harmful microorganisms.
- Wound healing: Enhanced collagen formation and skin regeneration.
- Anti-inflammatory: Suppressed prostaglandin synthesis and reduced swelling.
- Antioxidant: Protected tissues against oxidative stress and free radical damage.
- Antiviral and immunomodulatory: Supported immune function and fought off infections.

Morphological Characteristics Neem (Azadirachta indica)

Leaves: **Compound, paripinnate with 13-21 leaflets.** **Leaflets are ovate lanceolate, serrated, and have a dark green colour.** **Leaves have a strong, unpleasant odour when crushed.**	
Flowers: **Small, white, and fragrant.** **Arranged in axillary panicles.** **Flowers are unisexual or bisexual.**	
Fruits: **Drupes, oval-shaped, and green or yellowish-brown in colour. Fruits contain a single seed.**	

Bark: **Rough, fissured, and grey-brown in colour.**	
Wood: **Hard, durable, and resistant to decay.** **These morphological characteristics help distinguish neem from other tree species and are useful for its identification and classification.**	

1.3. Curry Leaves (Murraya koenigii): Phytochemistry and Pharmacological Properties


CURRY LEAVES (Murraya koenigii) commonly known as Curry Leaves, belonged to the Rutaceae family and was primarily used in Indian cuisine. However, it had also been valued in traditional medicine for its antimicrobial, hepatoprotective, and antioxidant properties.

Phytochemistry

Curry Leaves contained

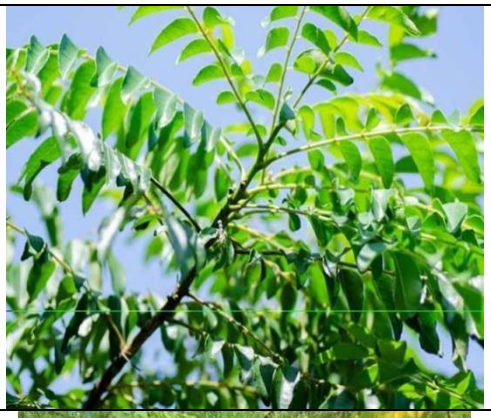
- Carbazole alkaloids (e.g., mahanimbine, koenimbine) – Reported to possess significant antibacterial and antifungal activities.
- Essential oils – Rich in compounds like α-pinene, β-pinene, and caryophyllene.
- Flavonoids, Tannins, and Saponins – Offered protective effects against oxidative and microbial damage.

Pharmacological Properties

- Antimicrobial: Active against a wide range of bacterial and fungal strains.
- Antioxidant: Neutralized harmful free radicals and prevented cellular damage.
- Wound healing: Accelerated the repair and regeneration of skin tissue.
- Anti-inflammatory: Reduced redness, itching, and swelling.
- Cytoprotective: Helped maintain the health of cells and tissues.

Morphological Characteristics Curry Leaves (Murraya koenigii)

Leaves: Compound, pinnate with 3-13 leaflets. Leaflets are ovate lanceolate, serrated, and have a dark green colour. Leaves have a strong, aromatic fragrance, especially when crushed.	
Flowers: Small, white, and fragrant. Arranged in axillary panicles. Flowers are bisexual	
Fruits: Small, drupes, oval-shaped, and orange-red in color.	

Bark: Rough, fissured, and grey-brown in colour.	
Habit: Shrub-like or small tree, reaching heights of 3-6 meters.	

1.4. Rationale for Herbal Gel Formulation

Topical formulations like gels offered several advantages in dermatological therapy, including:

- Targeted delivery
- Improved patient compliance
- Enhanced stability
- Minimized systemic side effects

The combination of Neem and Curry Leaves in a single gel formulation was based on their complementary pharmacological actions. While both plants were individually effective, their combined use was hypothesized to produce a synergistic antimicrobial and wound healing effect. The goal was to create a safe, affordable, and effective natural product suitable for daily use in minor cuts, burns, infections, and skin irritation.

1.5. Objectives of the Study

1. To extract the bioactive phytoconstituents from the leaves of Azadirachta indica and Murraya koenigii using the ethanolic maceration method.
2. To formulate a polyherbal gel by incorporating these extracts into a suitable gel base.
3. To evaluate the physicochemical properties of the gel: pH, Viscosity, Spreadability,

Homogeneity, Extrudability, Stability.

4. To determine the antimicrobial activity of the gel against selected gram-positive and gram-negative strains.
5. To assess the potential of the gel as a natural, effective topical therapeutic agent.

LITREATURE REVIEW

1. **NAME OF ARTICLE -** Antifungal activity of curry leaf (Murraya Koenigii) extract and an imidazole fungicide on two dermatophyte taxa.

NAME OF AUTHOR - A. Jayaprakash and P. Ebenezer

ABSTRACT - Antifungal potency of the ethanolic extract of Murraya Koenigii was evaluated against two dermatophyte taxa, namely, Trichophyton mentagrophytes and Microsporum Gypseum. The Ethanolic Murraya Koenigii extract was assessed against an imidazole fungicide.

CONCLUSION

The study evaluated the therapeutic value of the ethanolic Murraya Koenigii extract. The fungicide and the extract exerted a significant effect on the morphological changes in hyphae. Further investigations should be carried out to isolate and evaluate the antifungal compound in the extract to replace synthetic fungicides.

https://www.researchgate.net/publication/321177569_Antifungal_activity_of_curry_leaf_Murr a ya_ koenigii_extract_and_an_imidazole_fungicide_on_two_dermatophyte_taxa

2. **NAME OF ARTICLE-** Review Article on Phytochemical, Pharmacological activity of Murraya Koenigii.

NAME OF AUTHOR - Dr Anil Kumar.

ABSTRACT - Murraya Koenigii is having broad types of characteristics such as antimicrobial activity, Anti-inflammatory, Antipyretic activity, Cytotoxic activity, Anthelmintic effects, antibacterial activity, antifungal activity, antiprotozoal activity. The matured curry leaves consist of moisture, protein which is about 1.15% of nitrogen, carbohydrate 14.6%. **Conclusion -** The various pharmacological activities of the plant has been seen such as antimicrobial activity, anti-bacterial, antifungal, cytotoxic activity, anti-

inflammatory, hepatoprotective, anthelmintic, chemoprotective and hypoglycaemic effect with many other phagocytic activities. The chemical composition of the Murraya Koenigii consists of essential oil alkaloids and terpenoid. The essential oil from leaves of Murraya Koenigii showed antifungal activity against C. albicans, C. tropicalis, A. niger, A. fumigates, Microsporum Gypseum.

https://www.doi.org/10.56726/IRJMETS31912

3. NAME OF ARTICLE - Antifungal activities and chemical characterization of Neem leaf extracts on the growth of some selected fungal species in vitro culture medium.

NAME OF AUTHOR -Mondali, N.K.; Mojumdar., A.; Chatterjee, S.K.; Banerjee, A.; Datta, J.K.; Gupta, S.

ABSTRACT - The efficacy of different extracts of neem leaf on seed borne fungi Aspergillus, Rhizopus and chemical characterization of the neem leaf extracts were studied in vitro on the culture medium. subsequent chemical characterization of the needed leaf extracts were mediated for its antifungal activity. **Conclusion -** It may be concluded that Azadirachta Indica, a common medicinal plant could be exploited as the source of a potent biocide that have immense fungi toxic effect to several fungal pathogens like Aspergillus and Rhizopus. The radial growth of Aspergillus and Rhizopus was inhibited in vitro By water and ethanolic leaf extracts of Azadirachta Indica, suggesting the presence of antifungal substances.

https://www.researchgate.net/publication/27796935_Antifungal_activities_and_chemical_charact
erization_of_Neem_leaf_extracts_on_the_growth_of_some_selected_fungal_species_in_vitro_c ulture_medium

4. NAME OF ARTICLE - Formation and Evaluation of Antifungal Polyherbal ointment of different plant extract.

NAME OF AUTHOR - Kamlesh Kumar Yadav, Asha Roshan, Navneet Kumar Verma.

ABSTRACT

The major goal of the current investigation is to create and assess a multi-herbal ointment with antifungal activity. Ointments made from ethanolic extracts of Azadirachta indica,

Allium Sativum and Psidium guajava, were tested against Trichophyton Rubrum and Trichophyton mentagrophytes for their antifungal efficacy. **Conclusion -** Allium Sativum, Psidium Guajava, and Azadirachta Indica combined ethanolic extracts showed superior in-vitro antifungal activity, compared to the individual extracts. Azadirachta Indica, Allium Sativum and Psidium Guajava can also be utilized to create an effective antifungal ointment with antibacterial and antioxidant activity that can also be used for wound healing and a variety of skin illnesses.

https://www.researchgate.net/publication/362744745_FORMULATION_AND_EVALUATION_OF_ANTIFUNGAL_POLYHERBAL_OINTMENT_OF_DIFFERENT_PLANT_EXTRACT

5. **NAME OF ARTICLE -** Review Article of Therapeutics Role of Azadirachta Indica (Neem) and Their Active Constituents in Diseases Prevention and Treatment.

NAME OF AUTHOR - Mohammad A. Alzohairy.

ABSTRACT

Azadirachta Indica is a rich source of antioxidants. The role of Azadirachta Indica in the prevention and treatment of diseases via the regulation of various biological and physiological pathways is observed. Neem and its chief constituents play pivotal role in anticancer management through the modulation of various molecular pathways including p53, p10, NF-*κ*B, PI3K/Akt, Bcl2, and VEGF. **Conclusion:** s. The role of Neem as a chemopreventive effect has been noticed in various procedures of cell signaling pathways. Clinical based studies confirmed that neem plays a pivotal role in prevention of various diseases. Administration of lyophilised powder of the Neem extract for 10 days at the dose of 30 mg twice daily showed significant decrease (77%) of gastric acid secretion.

https://pubmed.ncbi.nlm.nih.gov/27034694/

6. **NAME OF ARTICLE -** A Review on Medicinal Kalpavriksh Neem (Azadirachta Indica).

NAME OF AUTHOR - I. V. Srinivasa Reddy and P. Neelima.

ABSTRACT

More than 150 compounds have been isolated from different parts of neem and these have been divided into two major classes: Isoprenoids and non-isoprenoids. All parts of the neem tree; leaves, flowers, seeds, fruits, roots and bark have been used traditionally for the treatment of inflammation, infections, fever, skin diseases, dental disorders, etc. It also exhibits immune modulatory, anti-inflammatory, anti hyperglycaemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic properties.

CONCLUSION

Neem is one the best nontoxic biological sources. The Fungi against infects hair, skin and nails. Considering the immense importance of this “Kalpavriksha” it can be explored for economic and therapeutic utilization for a sustainable development.

https://www.researchgate.net/publication/358875244_Neem_Azadirachta_indica_A_Review_on_Medicinal_Kalpavriksha

7. **NAME OF ARTICLE -**AN OVERALL REVIEW ON TOPICAL PREPARATION GEL

NAME OF AUTHOR - A. KRISHNA SAILAJA1, R. SUPRAJA

ABSTRACT

A gel is a two-component, cross linked three-dimensional network consistig of structural materials interspersed by an adequate but proportionally large amount of liquid to form an infinite rigid network structure which immobilizes the liquid continuous phase within. Ideally, the gelling agent for pharmaceutical or cosmetic use should be inert, safe, and should not react with other formulation components. The gelling agent included in the preparation should produce a reasonable solid like nature during storage that can be easily broken when subjected to shear forces generated by shaking the bottle. **Conclusion:** gels represent a unique class of materials with diverse applications in pharmaceuticals and cosmetics. Their properties, classification, preparation methods, and evaluation parameters are essential for

developing effective gel formulations. The ongoing research and development in this field continue to enhance our understanding and utilization of gels, paving the way for innovative applications in drug delivery and beyond. Future studies should focus on optimizing gel formulations for specific therapeutic applications.

https://www.researchgate.net/publication/311588332_AN_OVERALL_REVIEW_ON_TOPICA L_PREPARATIONGEL

8. NAME OF ARTICLE - A REVIEW ON PHARMACEUTICAL GEL

NAME OF AUTHOR - ROYCHOWDHURY SANTANU*, SINGH DEEP HUSSAN, GUPTA RAJESH, MASIH DALJIT.

ABSTRACT

S. Topical application of drugs offers potential advantages of delivering the drug directly to the site of action and acting for an extended period of time. Skin is one of the most extensive and readily accessible organs on human body for topical administration and is main route of topical drug delivery system. Gels have better potential as a vehicle to administered drug topically in comparison to ointment, because they are non-sticky requires low energy during the formulation. Gels are evaluated by following parameters such as pH, drug content, viscosity (Brookfield viscometer), spreadability, and extrudability, skin irritation studies.

CONCLUSION

The gel formulation can provide better absorption characteristics and hence the bioavailability of drug. A thorough investigation into the stability characteristics of the gel formulation over an extended period of time may provide scope for its therapeutic use for patients. Since the polymer is water-soluble; consequently, it forms a water washable gel and has wider prospects to be used as a topical drug delivery dosage form. The principal advantage of topical drug delivery lies in targeting the drug action directly to the site of disorder by allowing accumulation of high local drug concentration within the tissue and around its vicinity for enhanced drug action.

https://arastirmax.com/en/system/files/1066/12-25-26-ijprbs-174.2.pdf

8. **NAME OF ARTICLE -** A Review: Pharmaceutical Gels and Its Types with Prominence Role of Its Drug Delivery.

NAME OF AUTHOR - Samyuktha. Metta, Khan Mohammed Amir, Muppidi Sai Lakshmi, Pooja Devi, Kanna Shruthi

ABSTRACT

Gels as a semisolid system consisting of dispersion made up of either small inorganic particle or large organic molecule enclosing and interpenetrated by liquid. The inorganic particles form a three-dimensional “house of cards” structure. As far as structure is concerned, Gels consist of two-phase system in which inorganic particles are not dissolved but merely dispersed throughout the continuous phase and large organic particles are dissolved in the continuous phase, randomly coiled in the flexible chains.

CONCLUSION

Research and development for the formulation of pharmaceutical gels for wound healing purpose has grown in recent decades owing to its obvious benefits. With the progress in the pharmaceutical field and industry, it is assured that pharmaceutical gels will still be an interesting and appealing area of research for years to come. More advanced technologies and methods will be used for preparation, formulation and evaluation of gels in coming years. The demand of herbal constituents based gels are also increased day by day.

https://www.researchgate.net/profile/Samyuktha-Metta2/publication/372195691_A_Review_Pharmaceutical_Gels_and_Its_Types_with_Prominence_Role_of_Its_Dr ug_Delivery_Systems/links/64a93da695bbbe0c6e20065c/A-Review-PharmaceuticalGels-and-Its-Types-with-Prominence-Role-of-Its-Drug-Delivery-Systems.pdf

9. **NAME OF ARTICLE -** Polymeric Gels and Their Application in the Treatment of Psoriasis Vulgaris: A Review

NAME OF AUTHOR - Agnieszka Kulawik-Pióro and Małgorzata Miastkowska

ABSTRACT

Psoriasis is a chronic skin disease, and it is especially characterized by the occurrence of red, itchy, and scaly eruptions on the skin. The quality of life of patients with psoriasis is decreased because this disease remains incurable, despite the rapid progress of therapeutic methods and the introduction of many innovative antipsoriatic drugs. To improve the quality

of patients' lives, it is important to gain knowledge about the specific form of the drug and its effect on the safety and efficacy of a therapy as well as the patients' comfort during application. We discuss the following polymeric gels: hydrogels, oleogels, emulgels, and bigels. In our opinion, they have many characteristics (i.e., safety, effectiveness, desired durability, acceptance by patients), which can contribute to the development of an effective and, at the same time comfortable, method of local treatment of psoriasis for patients.

CONCLUSION

It is estimated that as much as 2% of the population suffers from psoriasis, and current topical treatment does not yield satisfactory results. Yet in our opinion, researchers should place greater emphasis on the impact of texture and rheological properties on the effectiveness of the therapy, in particular on tolerability by patients. The obtained insight regarding the influence of dosage form on the degree of satisfaction with the treatment could be helpful in supporting the selection of the dosage form in clinical practice. The more the product is focused on the satisfaction with the treatment, the more patients are prone to follow therapeutic recommendations and to achieve good results from the treatment.

https://www.mdpi.com/1422-0067/22/10/5124

10. NAME OF ARTICLE- Formulation and evaluation of herbal gel.

NAME OF AUTHOR -Ganesh Misal, Gouri Dixitand, Vijay Gulkari1

ABSTRACT

The gel formulation was designed by using methanolic extract of leaves of C alata and C tora and aerial part of C. dactylon in varied concentrations (1, 2 and 4%). Topical antiinflammatory activity of gel was also evaluated. The gel was prepared by using Carbopol 940 (1% w/v), C. alata, C. tora and C. dactylon extract, ethanol, propylene glycol 400, methyl paraban, propyl paraben, EDTA, tri-ethanolamine and required amount of distilled water. The prepared gels were evaluated for physical appearance, pH, spread ability, skin irritation to observe toxicity or side effects and also for anti inflammatory activity. It was inferred from the results that gel formulations were good in appearance and homogeneity.

CONCLUSION

It is inferred from results that the gel formulationsare good in appearance, homogeneity and easilyspread able and showed significant inhibition incarrageenan induced and formalin

induced pawoedema in Wistar rat models. The results also showed that the antiinflammatory effect of the formulation containing 4% of C. alata gel was better than the effect formulation. https:/www.researchgate.net/publication/288361178_Formulation_and_evaluation_of_herbal_gel

11. **NAME OF ARTICLE -** FORMULATION AND EVALUTION OF HERBAL ACNE GEL.

NAME OF AUTHOR – M Santhosh Aruna*, A. Sravani, V. Resshma, N. Santhi Priya, M. Surya Prabha and N. Rama Rao.

ABSTRACT

Acne vulgaris is an extremely common skin disorder that affects virtually all individuals at least once during life. Acne can have important negative psychosocial consequences for the affected individual, including diminished self-esteem, social withdrawal due to embarrassment and depression. Acne represents a significant challenge to dermatologists because of its prevalence, complexicity and range of clinical expression. It is the single most common skin disease affecting 85% of teenage boys and 80% of teenage girls and can continue throughout adulthood.

CONCLUSION

From above results it is concluded that on combining the oils and materials of different components in different ratio to get multipurpose effect such as whitening, anti-aging and sunscreen effect and anti acne effect on skin. As we know by combining the different natural components can be possible to increase the efficacy. In this regard, we mixed the different oils and powders to improve as well synergize the cosmetic properties of prepared product. The product was found to have good potency against acne inducing bacteria. The formulations developed from it also showed the same results so it can be further used commercially to develop the anti-acne formulation and can be further tested on human beings. https://wjpr.s3.ap-south-1.amazonaws.com/article_issue/1430803208.pdf

12. **NAME OF ARTICLE -** Identification, evaluation and standardization of herbal drugs: A review.

NAME OF AUTHOR - Archana Gautam*, Shiv Jee Kashyap, Pramod Kumar Sharma, Vipin Kumar Garg, Sharad Visht, Nitin Kumar

ABSTRACT

For preparation of any herbal formulation identification, evaluation and standardization is rudimentary. Identification involves the morphology, microscopy parameter of plants, evaluation and standardization of herbal drugs includes physical, chemical and biological parameters. These parameters are crucial for preparation of accurate and potent formulation. Reason of these studies involve the safe and accurately selection and handling of crude materials, ensure efficacy and stability of finished product, documentation of safety and risk based on experience, provision of product information to consumer and product promotion.

CONCLUSION

Monographs as compiled in the standard books like Indian Pharmacopoeia, Ayurvedic Pharmacopoeia of India, Wealth of India and Ayurvedic formulary, provide all the details for the various tests to be performed in order to determine the conformity of the crude or formulated herbal drug with the standards lay. It is also important to study the influence of the various factors like effect of the environment, climate, growth conditions and condition of the storage on the potency of a crude drug or the formulation prepared using it as a whole or as extract or the constituent isolated.

file:///C:/Users/Shreyesh/Downloads/IdentificationEvaluationStandardizationofHerbalDrugsRevi ew%20(2).pdf

13. NAME OF ARTICLE- PHYTOCHEMICAL STUDIES OF CURRY (MURRAYA KOENIGINI) AND EUCALYPTUS (EUCALYPTUS GLOBULUS) LEAVES EXTRACT

NAME OF AUTHOR - Ravi Kumar Khare, Giridhar Das, Suman Kumar, Vidhi Gautam, Subhradal Nuth, Rupesh Verma, Jai Prakash, Vikram Poonia, Supriya Sachan, Musku Nikhitha Reddy and Nitin Yadav

ABSTRACT

Murraya koenigii is a medicinal tree belonging to the family of Rutacae and it is known as "curry leaves". Trees are mostly found in srilanka, and south east asia. The Literature sims to study various phytochemical tests are performed in order to make a complete analysis of the curry leaves.

CONCLUSION

The highest yield was observed for both extracts i.e. aqueous and methanolic extracts in the

leaves of both extracts. Brownish black colored powder was observed in murraya koenigii leaves. Aqueous and methanolic M. koenigii leaves possess the tests for alkaloids, saponins, tannins, and flavonoids. However, the proteins are found to be additional constituents in the methanolic extract.

https://www.researchgate.net/publication/358266926_Phytochemical_Studies_of_Curry_Murray a_koenigii_and_Eucalyptus_Eucalyptus_globulus_Leaves_Extracts

14. NAME OF ARTICLE- Formulation and evaluation of topical niosomal gel of baclofen

NAME OF AUTHOR- Mohamed A. El-Nabarawi, Ehab R. Bendas, Mohamed S. El-Ridy, Gehad A. Abdel Jaleel and Samar M. Nasr-Alla

ABSTRACT

Niosomal formulations as carriers for the topical delivery of baclofen will prolong the contact time and increase the permeability through the skin as anti-inflammatory. The baclofen niosomes were prepared by altering the ratios between various non-ionic surfactants (Span 60, 40), cholesterol and charge inducing agents using thin film hydration method, the prepared niosomal formulations were evaluated for their encapsulation efficiency and maximum entrapment efficiency attained a maximum value of 80.31%, The maximum cumulative release percentage was between 65.55%.

CONCLUSION

e. The incorporation of baclofen and two niosomal baclofen formulations into Carbopol 934 reflect faster permeation behavior than Pluronic F127. It is expected to minimize the side effects due to selective built up of drug concentrations at the site of action as topically applied niosomes can increase the residence time of drugs in the stratum corneum and epidermis, while reducing the systemic absorption of drug. They are through to improve the horny layer properties, both by reducing trans epidermal water loss and by increasing smoothness via replenishing lost skin lipids.

https://www.researchgate.net/profile/Samar-Nasr-Alla/publication/271927758_Formulation_and_evaluation_of_topical_niosomal_gel_of_baclofe n/li nks/54d718630cf246475812dd5a/Formulation-and-evaluation-of-topical-niosomal-gel-ofbaclofen.pdf

15. NAME OF ARTICLE- Hydrogel-Based Active Substance Release Systems for Cosmetology and Dermatology Application: A Review

NAME OF AUTHOR- Martyna Zagórska-Dziok and Marcin Sobczak.

ABSTRACT

Hydrogel formulations from natural, semi, or synthetic polymeric materials have gained great attention in recent years for treating various dermatology maladies and for cosmetology procedures. The purpose of this review is to present a brief review on the basic concept of hydrogels, synthesis methods, relevant mechanisms, and applications in dermatology or cosmetology.

CONCLUSION

Hydrogel-based systems offer positively tremendous potential. Hydrogel biomaterials should not only provide support for regeneration and skin repair processes but also achieve local highly controlled release of therapeutic substances. Although considerable progress has been made in research and technology of biomedical hydrogels, many problems have yet to be resolved like high complexity of the immune response and tissue repair processes in the human body. https://www.mdpi.com/1999-4923/12/5/396

MATERIALS AND APPARATUS REQUIRED: -

- Beakers Glass rods
- Soxhlet apparatus Mortar & Grinder Heating Mantle Water Bath
- Volumetric flask Measuring cylinder Mechanical stirrer Whatman paper
- Funnel
- Tripod stand
- Weighing machine Test tubes
- Test tubes stand Bunsen burner Burette
- Pipette pH meter
- Volumetric cylinder
- Soap mould rectangular shape Labels, covers, marker
- Carbopol 940
- Propylene glycol
- Methyl paraben (0.5%)
- Propyl paraben (0.2%) Glycerin

- Triethanolamine Distilled water Menthol
- Neem extract
- Curry leaves extract

INGREDIENTS	QUANTITY	USES
Carbopol 940	1.0gm	Thickening agent
Propylene glycol	10 ml	Humectant, Dispersing agent
Methyl paraben (0.5%)	0.2 ml	Preservative
Propyl paraben (0.2%)	0.1 ml	Preservative
Glycerin	1 ml	Humectant, Emollient
Triethanolamine	q. s	PH & Buffering agent
Distilled water	100ml	Vehicle
Menthol	1.0 gm	Cooling agent &Anti-biofilm activity.

METHODLOGIES

3.1 Collection and Authentication of Plant Materials

The raw plant materials used in this study were neem leaves (Azadirachta indica) and curry leaves (Murraya koenigii), both known for their medicinal properties. Fresh leaves were collected from local gardens and herbal nurseries in [insert location] during the early morning hours to ensure maximum phytochemical content. The collected plant materials were carefully sorted to remove any debris, dried leaves, or extraneous matter.

After collection, the plant samples were washed thoroughly with tap water followed by distilled water to remove dust and microbial contaminants. The leaves were then shade-dried at room temperature for approximately 7–10 days to prevent the loss of volatile constituents. The dried leaves were coarsely powdered using a mechanical grinder and stored in airtight containers until further use for extraction.


Authentication of the plant materials was performed at the Department of Botany, [insert college/university name]. A certified botanist confirmed the identity of neem and curry leaves based on morphological characteristics such as leaf shape, venation, color, and aroma. Voucher specimens of both plant species were prepared and submitted to the herbarium of the department for future reference. This step ensured that the plant materials used in the study were genuine and suitable for research purposes. Proper authentication is crucial to guarantee the reliability of results, as any variation or contamination in plant species can significantly affect the outcome of herbal formulation development and evaluation.

3.2 Extraction of Plant Materials

The extraction process is a critical step in isolating the active phytoconstituents from neem (Azadirachta indica) and curry (Murraya koenigii) leaves for the preparation of the herbal gel. The powdered leaves obtained from the collection and drying process were subjected to solvent extraction using the Soxhlet extraction method, which is commonly used for the efficient recovery of plant bioactives.

Initially, 50 grams of powdered neem leaves and 50 grams of powdered curry leaves were packed separately in thimbles and placed inside the Soxhlet apparatus. Ethanol was used as the solvent due to its polarity and ability to extract a broad range of phytochemicals including alkaloids, flavonoids, and tannins. Each extraction was carried out for 6 to 8 hours, maintaining a consistent temperature using a water bath.

The extract obtained was filtered using muslin cloth followed by Whatman filter paper to

remove coarse particles. The filtrate was then concentrated using a rotary evaporator under reduced pressure at 40–50°C to obtain a semi-solid mass. The concentrated extract was stored in amber-colored glass bottles and kept in a refrigerator at 4°C to protect it from light and heat degradation until further use in the gel formulation. The efficiency of the extraction process was ensured by observing the clarity, color, and consistency of the extract. These extracts formed the active ingredient base for the herbal gel, and their concentration in the formulation was optimized based on preliminary screening and literature reports on therapeutic efficacy.

3.3 Preparation of Herbal Gel

The herbal gel containing neem and curry leaf extracts was prepared using Carbopol 940 as the gelling agent, owing to its excellent viscosity and compatibility with herbal components. The preparation was carried out in a clean, controlled environment to ensure formulation stability and minimize contamination. To begin, 1% w/w of Carbopol 940 was slowly sprinkled into distilled water while stirring continuously using a mechanical stirrer at moderate speed to prevent lump formation. The dispersion was allowed to hydrate and swell for about 2 hours. After complete hydration, the mixture was neutralized using a few drops of triethanolamine (TEA), which adjusted the pH and resulted in gel formation. The pH was adjusted to between 5.5 and 6.5, ideal for topical applications.

In a separate beaker, the ethanolic extracts of neem and curry leaves were mixed with a small amount of ethanol and a natural preservative like methylparaben. The extracts were then added

slowly into the gel base with continuous stirring to ensure uniform distribution of the active constituents. Care was taken to avoid incorporation of air during mixing. The gel was continuously stirred until a homogeneous, clear, and smooth gel was obtained. The final gel was stored in airtight, sterile glass containers and labeled appropriately. The formulation was kept in a cool, dry place away from direct sunlight until further evaluation. This step was crucial to develop a stable and skin-compatible herbal formulation enriched with the therapeutic benefits of neem and curry leaves.

3.4 Formulation Development

The formulation development of the herbal gel aimed to achieve an effective, stable, and cosmetically acceptable product incorporating the therapeutic properties of neem and curry leaf extracts. Multiple trial batches were prepared using varying concentrations of the extracts to identify the optimal formulation based on physical appearance, stability, and performance. Each batch was prepared following the same procedure, ensuring uniformity in mixing and consistency. The physical parameters like color, odor, consistency, pH, spread ability, and homogeneity were recorded immediately after preparation and periodically over a storage period of one month. The aim was to identify the most stable and aesthetically pleasing formulation that maintained uniform dispersion of the herbal extracts without phase separation or microbial contamination. Based on preliminary evaluations, the optimal formulation was selected for further characterization and evaluation studies. The selected gel demonstrated

good consistency, desirable pH, spread ability, and antimicrobial potential, indicating its suitability for topical application. This formulation was then subjected to extensive evaluation under various physicochemical and biological parameters to assess its safety and effectiveness.

EVALUATION TEST

APPERANCE- Focuses on its visual properties such as clarity, color, uniformity and the presence of particles or bubbles

The prepared herbal gel was evaluated visually for its color, clarity, texture, and homogeneity. The optimal formulation appeared greenish-brown in color due to the natural pigmentation of neem and curry leaf extracts. The gel had a smooth and uniform consistency without any lumps or phase separation. It exhibited a translucent to slightly opaque appearance, depending on the concentration of extracts used. No grittiness or visible particulate matter was observed, indicating proper filtration and incorporation of the extracts into the gel base.

VISCOSITY- It refers to the gel's thickness or resistance to flow. It is a critical property that affects the ease of application, spreadability and absorption

The viscosity of the herbal gel was measured using a Brookfield Viscometer. A sample of the gel was placed in the appropriate spindle container and measured at room temperature using spindle number 64 at 50 rpm. The viscosity value was recorded in centipoise (1000-4900cP). The optimized formulation showed a viscosity range suitable for topical use—neither too thick to hinder spreadability nor too runny to lack retention.

SPREADABILITY- It refers to how easily and evenly the gel can be applied to a surface such as skin. A gel with good spreadability requires minimal effort to distribute uniformly covering a wide area without clumping or leaving a residue

Good spreadability of the formulated gel is a significant positive attribute, indicating a well-designed system that allows for easy and uniform application. This characteristic is crucial for product efficacy and user satisfaction, stemming from a carefully balanced composition and appropriate rheological properties.

PH- It refers to the acidity or alkalinity of the gel, which is crucial for compatibility with the skin or intended application area

The pH of the optimized formulation was found to be within the desirable range (5.5-6.5) using pHmeter, confirming that it would not cause irritation or discomfort upon application to

the skin. Proper pH adjustment using triethanolamine ensured the gel remained stable over the study period.

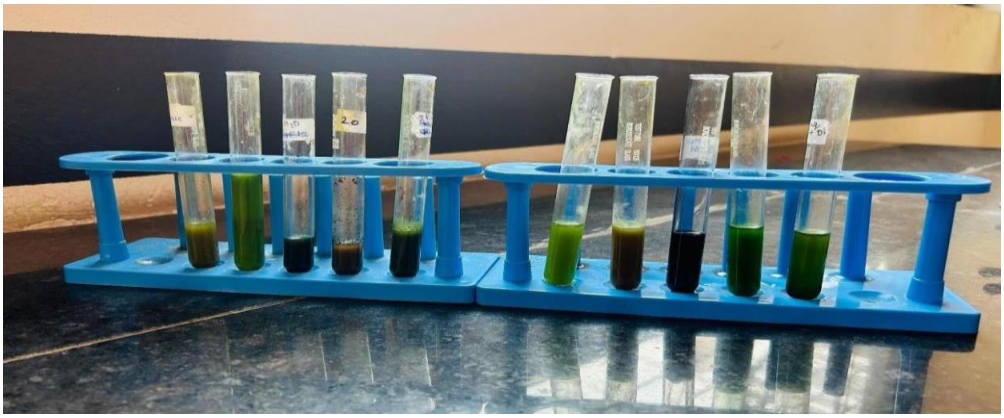
Patch test -The patch test in gel evaluation is a safety assessment method where the gel is applied to a small skin area under occlusion to check for irritation or allergic reactions. No adverse reaction observed; herbal gel passed the patch test. Herbal gel found to be nonirritating in the patch test. Patch test successfully passed from the sample.


Phytochemicals test analysis				
Sr.No	**Phytoconstituents/Test**	**Test**	**Procedure**	**Result**
1.	Alkaloids Test	Dragendroff Test	1gm of dried powder of Murraya Koenigii plant sample mixed with methanol and added dil.Hcl to the remaining. Mixed well and followed by filtrated collection was added with few drops of dragendroff reagent	Yellowish & White color precipitate Indicates the presence of alkaloids
		Wagner's Test	Add 2-3 drops of wagnor reagent to 2- 3ml of extract and mixed well.	Formation of brown or yellow precipitate indicates the presence of alkaloids
2	Flavonoids Test	Shinoda Test	Add 2-3ml of the extract to a test tube. Add a small amount (10-20mg) of magnesium powder. Add 1-2 drops of con. Hcl	Formation of a reddishorange, pink or purple color indicates the presence of flavonoids
		Alkaline Reagents Test	Add 2-3ml of the extract to a test tube + 1-2drops of NaoH solution.Mix well and observe the color change.	Formation of Yello, orange or red color indicates the presence of flavonoids.
3	Saponins Test	Foam Test Hemolysis	Prepare 10-20% leaf extract in distilled water. Shake vigorously for 1530 sec. Observe foam	Persistent foam (>1 cm height) indicate the presence of saponins

		Test	formation and height. Prepare 10-20% leaf extract in PBS. Mix with defibrinated blood (2:1) Incubate at 37 for 30 min. centrifuge and measure (540nm).	>50% hemolysis indicates saponin presence
4	Terpenoids Test	-	3ml of extract dissolved in 1 ml of chloroform in a test tube and added 1 ml of con. H2SO4 into the test tube.	Reddish-brown coloration at the interface indicates presence of Terpenoids
5	Glycosides Test	Molisch's Test	Prepare the leaf extract add 2-3 drops of Molisch's reagent + 1-2 ml of sulphuric acid	Purple color indicates the presence of glycosides
		Borntrager's Test	Prepare leaf extract add 2- 3 drops of ferric chloride + 1-2 ml of Hcl	Reddish-Brown color indicates the presence of cardiac glycosides
6	Test For Phenols	-	2 ml of extract was taken in a test tube and few drops of 1% ferric chloride in a test tube	Green/bluish green /brownish red color indicates the presence of phenol
7	Test For Tannins	-	0.5 gm of extract boiled in 4 ml of water in a test tube and then filtered. Few drops of 0.1% ferric chloride were added.	Brownish green or blue black colouration indicates the presence of tannins

Results for phytochemical test

Phytochemical Tested	*Result for Neem*	*Result for Curry Leaves*
Phenols	Present	Present
Tannins	Present	Present
Saponins	Present	Present
Terpenoids	Present	Present
Steroids/Sterols	Present	Present
Glycosides	Present	Present



MICROBIAL EVALUATIONS

Antimicrobial Activity

The antimicrobial activity of the herbal gel is a key evaluation parameter, as both neem and curry leaves are known for their potent antibacterial properties. This test helps determine the effectiveness of the gel in inhibiting the growth of common skin pathogens, supporting its use for treating minor infections, acne, or wounds. Test Organisms.

The antimicrobial activity was tested against selected bacterial strains and fungal strains. Bacterial cultures used are Escherichia coli or Staphylococcus aureus etc.

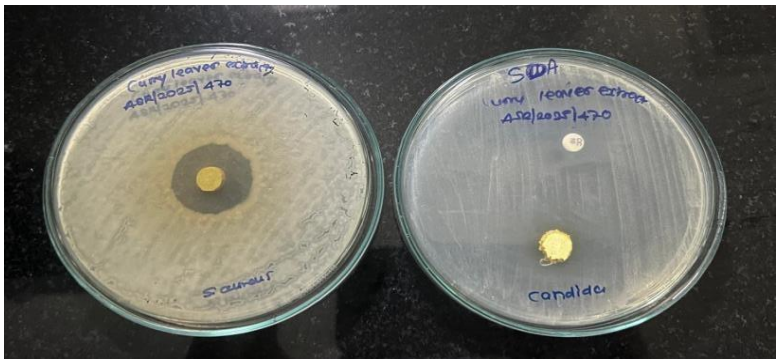
Fungal sample used are Candida albicans (This is a common species of yeast that can cause candidiasis) or Aspergillus Niger (This is a common mould that can cause aspergillosis).

Method Used

The agar well diffusion method was employed to assess antimicrobial efficacy. Sterile.

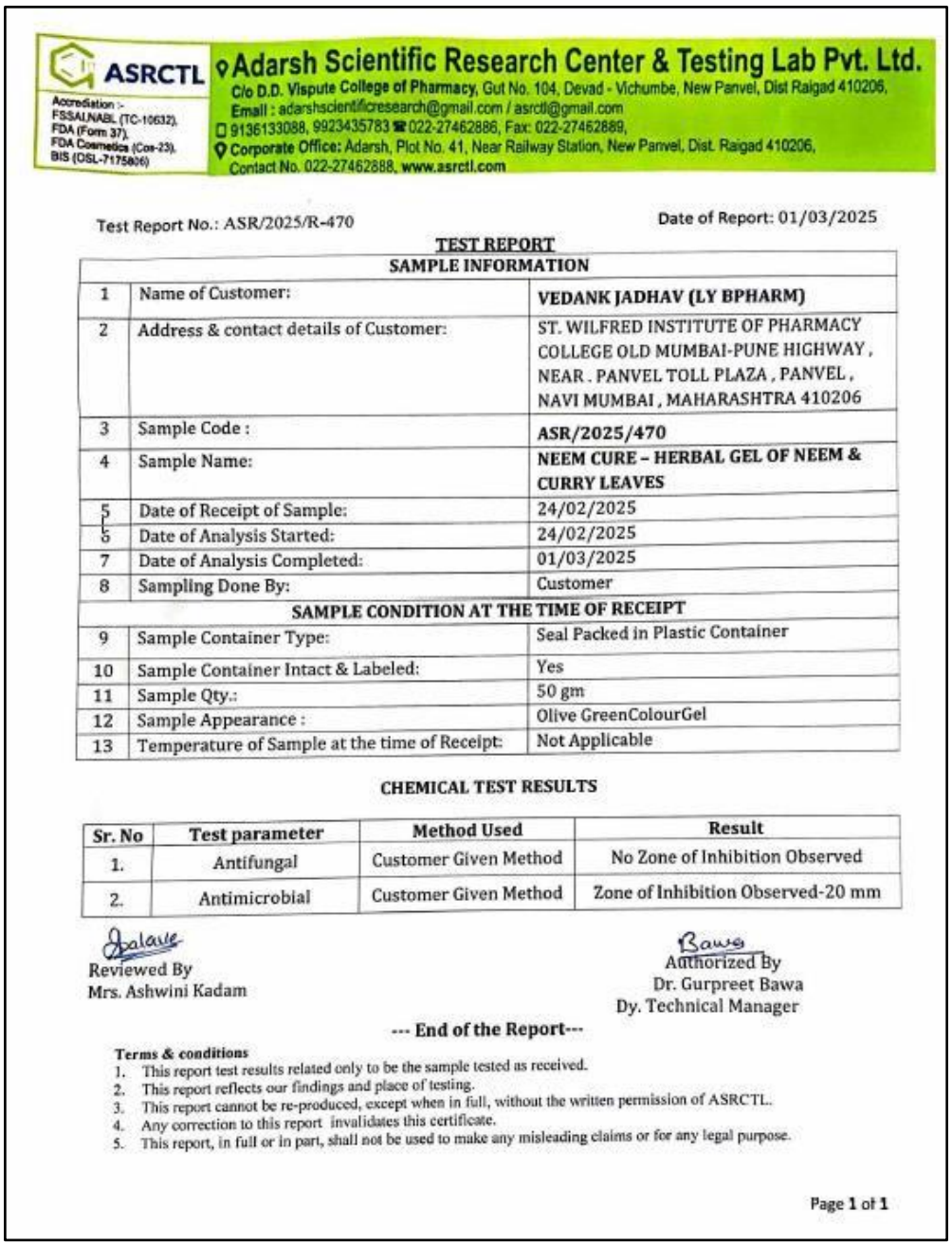
Mueller-Hinton

agar plates were inoculated with a standardized suspension of the test organisms. Wells of uniform size were bored into the agar using a sterile borer. Approximately 100 mg of the herbal gel was placed into each well. As controls, and another with gel base without extracts.



INCUBATION AND RESULTS

The plates were incubated at 37°C for 24 hours. After incubation, the diameter of the zone of inhibition around each well was measured in millimeters using a digital caliper. The formulated herbal gel exhibited significant zones of inhibition against both samples Based on the provided test report, the herbal gel of Neem and Curry leaves (Sample Code: ASR/2025/470) exhibited no zone of inhibition for antifungal activity, indicating no antifungal effect under the tested conditions. However, it showed a zone of inhibition of 20 mm for antimicrobial activity, suggesting a positive antimicrobial effect against the tested microorganism(s).



ASRCTL
Accreditation :- FSSAI,NABL (TC-10632), FDA (Form 37), FDA Cosmetics (Cos-23), BIS (OSL-7175806)

Adarsh Scientific Research Center & Testing Lab Pvt. Ltd.
C/o D.D. Vispute College of Pharmacy, Gut No. 104, Devad - Vichumbe, New Panvel, Dist Raigad 410206,
Email : adarshscientificresearch@gmail.com / asrctl@gmail.com
9136133088, 9923435783 ☎ 022-27462886, Fax: 022-27462889,
Corporate Office: Adarsh, Plot No. 41, Near Railway Station, New Panvel, Dist. Raigad 410206,
Contact No. 022-27462888, www.asrctl.com

Test Report No.: ASR/2025/R-470 Date of Report: 01/03/2025

TEST REPORT

	SAMPLE INFORMATION	
1	Name of Customer:	**VEDANK JADHAV (LY BPHARM)**
2	Address & contact details of Customer:	ST. WILFRED INSTITUTE OF PHARMACY COLLEGE OLD MUMBAI-PUNE HIGHWAY , NEAR . PANVEL TOLL PLAZA , PANVEL , NAVI MUMBAI , MAHARASHTRA 410206
3	Sample Code :	**ASR/2025/470**
4	Sample Name:	**NEEM CURE – HERBAL GEL OF NEEM & CURRY LEAVES**
5	Date of Receipt of Sample:	24/02/2025
6	Date of Analysis Started:	24/02/2025
7	Date of Analysis Completed:	01/03/2025
8	Sampling Done By:	Customer
	SAMPLE CONDITION AT THE TIME OF RECEIPT	
9	Sample Container Type:	Seal Packed in Plastic Container
10	Sample Container Intact & Labeled:	Yes
11	Sample Qty.:	50 gm
12	Sample Appearance :	Olive GreenColourGel
13	Temperature of Sample at the time of Receipt:	Not Applicable

CHEMICAL TEST RESULTS

Sr. No	Test parameter	Method Used	Result
1.	Antifungal	Customer Given Method	No Zone of Inhibition Observed
2.	Antimicrobial	Customer Given Method	Zone of Inhibition Observed-20 mm

Reviewed By
Mrs. Ashwini Kadam

Authorized By
Dr. Gurpreet Bawa
Dy. Technical Manager

--- End of the Report---

Terms & conditions
1. This report test results related only to be the sample tested as received.
2. This report reflects our findings and place of testing.
3. This report cannot be re-produced, except when in full, without the written permission of ASRCTL.
4. Any correction to this report invalidates this certificate.
5. This report, in full or in part, shall not be used to make any misleading claims or for any legal purpose.

Page 1 of 1

REFERENCES

1. Sandeep, D. S., et al. "Formulation and evaluation of antibacterial herbal gels of Murraya Koenigii leaves extract." Research Journal of Pharmacy and Technology, 2017; 10.6: 1798- 1801.
2. Handral, Harish K., Anup Pandith, and S. D. Shruthi. "A review on Murraya koenigii: multipotential medicinal plant." Asian Journal of pharmaceutical and clinical research, 2012; 5.4: 5-14.
3. Rashmi, Jyoti Bisht, and G. Naveen. "Phytochemical analysis and antibacterial activity of different leaf extracts of Murraya Koenigii." UBB, 2016; 1.5.
4. Anupam, Nayak, et al. "Review on chemistry and pharmacology of Murraya koenigii Spreng (Rutaceae)." Journal of Chemical and Pharmaceutical Research, 2010; 2.2: 286-299.
5. Jog, Charudatta S., Alpana J. Asnani, and Vijay Gulkari. "FORMULATION AND EVALUATION OF ANTIFUNGAL HERBAL HAIR GEL." (2020).
6. A. Jayaprakash and P. Ebenezer. “Antifungal activity of curry leaf (Murraya koenigii) extract and an imidazole fungicide on two dermatophyte taxa.
7. DR. Anil Kumar. “REVIEW ARTICLE REVIEW ON PHYTOCHEMICAL, PHARMACOLOGICAL ACTIVITY OF MURRAYA KOENIGII”.
8. Al Harbi, Hanan, Uma M. Irfan, and Sarah Ali, "The antibacterial effect of curry leaves (Murraya Koenigii)." EJPMR, 2016; 3: 382-387.
9. Ali, S. M., Ansari, S. H., & Ali, J. (2011). Formulation and evaluation of a topical gel of Azadirachta indica leaves extract for the treatment of acne vulgaris. International Journal of Pharmaceutical Investigation, 1(2): 126-131.
10. Das, A., Banik, K., Ghosh, A., & Chakraborty, R. (2013). Evaluation of wound healing activity of Murraya koenigii (Linn.) Spreng. leaves on excision wound model in albino rats. Journal of Ethnopharmacology, 146(2): 505-511.
11. Khan, A., Singh, P., Sharma, A., & Kumar, V. (2013). Formulation and evaluation of a polyherbal gel for anti-inflammatory activity. International Journal of Pharmaceutical Sciences and Research, 4(10): 3880-3886.
12. Biswas, K., Chattopadhyay, I., Banerjee, R. K., & Bandyopadhyay, U. (2002). Biological activities and medicinal properties of neem (Azadirachta indica). Current Science, 1 82(11): 1336-1345.
13. Arora, P., & Kamal, R. (2013). Murraya koenigii - An updated review. International Research Journal of Pharmacy, 4(4): 1-5.

14. Mishra, A. P., & Verma, A. (2012). Formulation and evaluation of herbal gel containing Aloe vera extract. International Journal of Pharmacy and Pharmaceutical Sciences, 4(3): 597-601.
15. Saxena, T., & Sharma, V. N. (2010). Antimicrobial activity of different fractions of Azadirachta indica A. Juss. leaf extract. Journal of Ethnopharmacology, 127(1): 135-139.
16. Cheel, J., Theoduloz, C., Rodriguez, J. P., & Schmeda-Hirschmann, G. (2009). Free radical scavenging activity and phenolic content of extracts prepared from Murraya koenigii (L.) Spreng. Food Chemistry, 113(3): 906-912.
17. Pandey, A., Sharma, S., & Malviya, R. (2010). Herbal gels: new era for topical drug delivery. Asian Journal of Pharmaceutical and Clinical Research, 3(1): 1-5.
18. Lodhi, S., & Singhai, A. K. (2013). Formulation and evaluation of herbal gel for wound healing activity. International Journal of Pharmaceutical Sciences and Research, 4(1): 208-214.
19. Upadhyay, S., Dixit, V. K., & Verma, A. (2014). Comparative phytochemical analysis and antimicrobial activity of different parts of Azadirachta indica A. Juss. International Journal of Pharmaceutical Sciences and Research, 5(3)**:** 786-791.