HBRP PUBLICATION Journal of Advanced Research and Reviews in Virology & Microbiology

e-ISSN: *3049-0936*

Volume 03 Issue 01 Jan-Jun 2026

***Corresponding Author: Patil Tanisha Madhukar**
Student of Final Year, Department of Pharmaceutics P.S.G.V.P. Mandals's College of Pharmacy, Shahada, Maharashtra, India

Submission Date: *Apr 16, 2026*
Copyright Received Date: *Apr 30, 2026*

Herbal Cream for Mosquito Protection: Development and Evaluation Study

Patil Shreyas Sanjay[1], Patil Vaishanvi Narendra[2], Patil Tanisha Madhukar[3*], Chaudhari Roshan M[4], Dr. Sunil P. Pawar[5]

[1,2,3] Student of Final Year, [4]Assistant Professor, [5]Principal Department of Pharmaceutics P.S.G.V.P. Mandals's College of Pharmacy, Shahada, Maharashtra, India

ABSTRACT

Mosquito-borne diseases continue a major global health challenge, moving millions of people annually and contributing to significant mortality, especially in tropical and subtropical regions. Conventional mosquito repellents, particularly those containing synthetic chemicals like DEET, are widely used but are associated with several drawbacks such as skin irritation, potential toxicity, and environmental concerns. This has led to growing interest in safer, plant-based alternatives.

This review focuses on the formulation and evaluation of a herbal mosquito repellent cream using natural ingredients such as neem, citronella, lemongrass, tulsi, and eucalyptus oils. These plant-derived components are known for their insect-repellent, antimicrobial, and skin-friendly properties. The extraction processes of active constituents and the preparation of a stable cream base using suitable excipients are discussed in detail.

Results indicate that the herbal formulation is effective, non-irritating, and environmentally friendly, with good consistency and stability.

Overall, this study highlights the potential of herbal mosquito repellent creams as a safer and sustainable alternative to synthetic products, offering effective protection against mosquito bites while minimizing health and environmental risks.

Keywords:- *Herbal Mosquito Repellent, Essential Oils, Plant-Based Formulation, Mosquito-Borne Diseases, Natural Insect Repellent Cream*

INTRODUCTION

Mosquito-borne diseases provide a huge global health concern, impacting about 700 million people each year and killing approximately one million people worldwide. The frequency of vector-borne illnesses such as malaria, dengue fever, yellow fever, and Japanese encephalitis is especially high in tropical and subtropic areas where mosquitos thrive. Despite intensive control methods, these diseases continue to impose significant economic and social costs, particularly in developing nations. Conventional mosquito control approaches have primarily depended on synthetic repellents, with the most often used active ingredient being N,N-diethyl-m-toluamide (DEET). However, accumulating research points to substantial downsides associated with synthetic repellents, such as possible neurotoxicity, skin irritation, and environmental persistence. Furthermore, the growth of insecticide-resistant mosquito populations has required the investigation of alternate control strategies. [1]

Mosquitoes have a variety of senses that allow them to monitor the presence of their prey, such as:

A. Chemical Sensors: Research has shown that mosquitoes can detect lactic acid, carbon dioxide, and propan-3-ol at distances of many yards. Both people and animals release these substances when they breathe or perspire. This explains why a person who perspires more is more likely to get bitten by the species than a person who perspires less.

B. Heat Sensors: Once they get close enough, mosquitoes can quickly target warm-blooded animals because they can sense heat.

C. Visual Sensors: It has been noted that mosquitoes are intelligent insects because they can quickly identify you by observing how your clothes contrasts with the surroundings. They can quickly identify you since anything that moves is alive and therefore contains blood. [2]

Many people are increasingly interested in utilizing natural, plant-based repellents as a result of these issues. Oils found in several plants naturally repel insects.

These oils, which are referred to as essential oils, can be utilized to create creams that are:

- Less harmful to the skin
- More environmentally friendly

Made with readily accessible ingredients for this project, we used natural oils from: to create an herbal insect repellent lotion.

- Citronella (its powerful scent keeps insects away)
- Lemongrass (which has a natural repellent called citronellal)
- Neem (used in traditional medicine to repel or kill insects)
- Eucalyptus, which repels insects and has a refreshing scent.
- Tulsi, which repels insects with its potent scent and active ingredients.[3]

Mosquito-Borne Diseases

Diseases Spread by Mosquitoes In terms of public health, mosquitoes are thought to be the most dangerous vector for the spread of deadly illnesses and parasites. Mosquitoes can directly or indirectly harm humans and animals. They feed on the blood of humans, animals, and other vertebrates, which can be bothersome and disruptive to people when they are outside. Mosquito bites frequently result in mild allergic reactions like red bump and itching. Malaria, dengue, west Nile virus, chikungunya, yellow fever, and Zika are among the main diseases spread by mosquitoes.

Mosquito Repellent

Applying a product to skin, clothing, or other surfaces that deters mosquitoes from landing on them is known as mosquito repellent. In order to lessen human-

mosquito contact, this material is manufactured in a way that makes the surface disagreeable and unappealing to mosquitoes. Numerous natural and synthetic insect repellents are available, such as DEET (N, N-diethyl meta-toluamide). Given the emergence of resistance, cross-resistance, potential toxicity risk, and growing expense of synthetic insecticides, interest in plant-based repellents has resurfaced. A useful tool for protecting oneself from bothersome mosquito bites that increase the risk of contracting diseases spread by mosquitoes is mosquito repellent. [4]

What are Mosquito Repellent Cream

The purpose of mosquito repellent lotions is to protect skin against mosquito bites. They function by disguising human Odors or erecting obstacles that keep mosquitoes away. These creams have components that confuse or deter mosquitoes, such as DEET, picaridin, or natural oils like citronella and lemon eucalyptus. Depending on the formula and kind of mosquito, they offer protection for 4–12 hours when applied directly to exposed skin. [5]

PLANT PROFILE

Neem

Biological Source: Neem consists of the fresh or dried leaves and other aerial parts of azadirachta indica belonging to the family Meliaceae.

Chemical Constituents: The chief constituents of Neem are azadirachtin, nimbi, nimbidin, nimbidol.

Fig.1:-*Neem leaves*

Lemongrass

Biological Source: It is obtained from the fresh aerial parts of Cymbopogon citral belonging to the family Poaceae.

Chemical Constituents: Lemongrass oil is the principle source of Citral. The oil also contain linolol, citronellal, citronellol, methyl heptanone.

Fig.2:- *Lemongrass leaves*

Tulsi

BiologicalSource: Tulsi consists of fresh and dried leaves of Ocimum sanctum belonging to the family Labiatae.

Chemical Constituents: It contains Eugenol, Carvacrol and eugenol-methyl-ether.[6]

Fig.3:-*Tulsi leaves*

CHEMICALS AND REAGENTS

The excipients used to make the cream base included stabilizers, emulsifiers, and oils. These were chosen based on their ability to generate a stable emulsion and improve the texture and spread ability of the end product. In the oil phase, stearic acid, a fatty acid, acts as an emulsifying agent. It thickens and provides consistency to the cream, so stabilizing the emulsion.

Cetyl Alcohol: A fatty alcohol that improves the formulation's emulsifying capacity and gives the cream a smooth, non-greasy texture.

Stearic Acid: A fatty acid that functions as an emulsifying agent in the oil phase. It helps to thicken and provide consistency to the cream, stabilizing the emulsion.

Beeswax: Is a natural wax that aids in the formation of a water-resistant barrier, allowing the cream to stay on the skin for a longer amount of time, providing more mosquito protection.

Liquid Paraffin: Mineral oil is used as a moisturizer to provide lubrication and smooth application of cream.

Glycerin: Is a humectant that attracts moisture to the skin and keeps the formulation from drying out. It also enhances the cream's creaminess.

Natural preservative: such as Vitamin E (tocopherol), were added to the formulation to prevent oil oxidation and extend product shelf life. All cosmetic and medicinal ingredients were sourced from recognized providers to ensure their quality. [2]

EXTRACTION OF HERBAL INGREDIENTS

Extraction of Neem

20g of dried, crushed neem leaves were mixed with 70% cc of ethanol to create extracts. The mixture was shaken for three hours every day for three days using a shaking machine to guarantee homogeneity. An ethanol-extract mixture was obtained as the filtrate after the mixture was filtered using gravity filtration.

In order to recover the majority of the solvent in each extract mixture, the ethanol-extract mixture was concentrated using a rotary evaporator setup that was controlled at a temperature of 50 °C under decreased pressure of roughly 4.5 b ar. After concentration, the neem leaf extract was put in an evaporating dish and stored in a desiccator until it was needed. [7]

Fig.4::-*Neem Extraction*

Tulsi Extraction

Tulsi powder sample (20 gm) was extracted with 70% ethanol and water (80:20) via maceration for 72 hours. After maceration, the material was filtered via a filter paper. To remove ethanol, the solvent is evaporated using a reduced pressure heating method at temperatures below 500°C. [8]

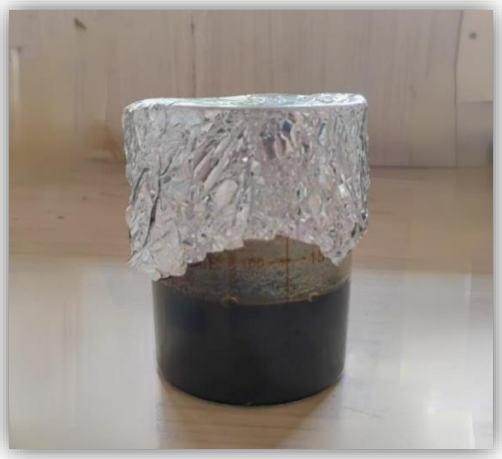

Fig.5:-*Tulsi Extraction*

Lemongrass extraction:

Lemongrass leaves are powdered (e.g., 20g sample) and soaked in solvents like ethanol (C_2H_6O) or acetone (C_3H_6O) at concentrations ranging from 50-70%. The mixture is placed in a shaking water bath at approximately 40°C for 24 hours, then centrifuged at 5000 rpm for 10 minutes. The extract is filtered and condensed to produce the oil. [9]

Fig.6:-*Lemongrass Extraction*

PREPARATION OF CREAM BASE

Preparation of Oil Phase:

Liquid paraffin, stearic acid, Cetyl alcohol, bees wax were carefully weighed and placed in a beaker. The oils were slowly dissolved in a water bath at 70°C with continual stirring, allowing them to combine. [10]

Preparation of Aqueous Phase:

In another beaker, warm distilled water and Glycerin.

Stir well to mix in water bath at 70°C. [11]

Emulsification Process:

Emulsification With constant stirring, the heated aqueous phase is gradually

introduced to the oil phase. For a smooth, consistent emulsion, mechanical stirrers or homogenizers are recommended. The mixture is stirred continuously until it is homogenous and creamy. The herbal extracts and essential oils (lemongrass, neem, and Tulsi) were combined with the cream base once the mixture had cooled to 40°C. Depending on the batch of formulation, the active ingredients were added at several concentrations (5%, 10%, and 15%) to assess their efficacy in repelling mosquitoes. After cooling, the final cream was sealed in glass jars that had been sterilized. The smooth, non-greasy texture of this cream base was ideal for topical application and gave the active compounds stability. [12]

Fig.7:-*Mosquito Repellent Cream*

Tabel 1:-*Formulation of Herbal Mosquito Repellent Cream*

S. No.	Ingredients	Purpose	Quantity(%w/w)
1	Stearic acid	Emulsifying agent	5 gm
2	Cetyl alcohol	Emollient & Thicker	2 gm
3	Beeswax	Thickening and stabilizing agent	1gm
4	Liquid paraffin	Emollient	5 ml
5	Sodium hydroxide	pH adjustment and emulsifier	0.2 gm
6	Glycerin	Moisturizer	5 ml
7	Citronella oil	Mosquito repellent	2.0 ml
8	Neem oil	Insectrepellent & antimicrobial	2.0 ml
9	Tulsi oil	Antimicrobial activity	2.0 ml
10	Eucalyptus oil	Insect repellent & fragrance	1.0 ml
11	Lemongrass oil	Mosquito repellent & fragrance	1.5 ml
12	Vitamin E	Natural preservative & antioxidant	0.5 ml
13	Distilled water	Aqueous phase	Q.s to 100[2]

EVALUATION OF CREAM

Physical Parameters

Organoleptic properties: Visual inspection was used to assess the prepared cream formulation for a number of characteristics, including colour, texture, odour, and any potential phase separation. You can get a sense of the cream's texture and homogeneity by applying a tiny amount on your finger and thumb.

Colour: Colour assessment A black and white background has been used to test colour evaluation visually, and any changes in colour have been noted.

Odour: Assessment of odour For more precise observation, the three participants were used to test the ointment's odour.

Texture: Assessment of texture It was discovered that the made cream was smooth and showed no signs of greed. [13]

PH Determination:

To determine pH, a certain quantity of cream (100 mg) was weighed, diluted in distilled water, and thoroughly mixed. A digital pH meter (Mettler Toledo) was used to measure the cream's pH. Every experimental formulation underwent a pH assessment. Triplicate20 measurements were made. [14]

Spread Ability:

The spreadability was measured in the number of seconds it took for two slides to separate from the cream that was sandwiched between them under a specific load. The better the spread ability, the less time it takes to separate the two slides. Two sets of standard-sized glass slides were collected. One of the slides was covered with the herbal cream formulation. The cream was sandwiched between the two slides when the other slide was positioned on top of the formulation. Weight was applied to the upper slides to ensure that the cream between the two slides was uniformly compressed to form a thin layer. The extra mixture sticking to the slides was scraped off once the weight was removed. The power of the weight attached to the upper slide made it possible for it to glide off freely. The upper slide's duration was recorded.

Skin Irritation

The irritancy test involves marking a 1 square centimeter area on the dorsal side of the left hand. After applying the cream to the designated area, the time was recorded. Erythema, edema, and irritation were assessed at regular intervals for up to 24 hours and reported. [15]

Stability Testing

Stability investigation of the optimized formulation (B5) was performed in compliance with International Conference on Harmonization (ICH) recommendations. For ninety days, the improved cream formulation (B5) was kept in tightly sealed glass containers at 25°C and 60% relative humidity in a humidity chamber. Samples were taken at predefined intervals of 0, 30, 60, and 90 days, and their physicochemical evaluation criteria, including color, consistency, phase separation, texture analysis, and pH, were assessed. [16]

Viscosity

Viscosity is a crucial factor in determining the cream's thickness or fluidity. It also has an impact on how the cream feels on the skin and how long it stays there without spilling. A Brookfield viscometer was used to measure viscosity at 25°C. The cream should be neither too runny nor too challenging to apply in order to have a good consistency. The cream's viscosity was determined to be 21,500 cps, indicating that it has a medium consistency. This means that it is thick enough for topical application without becoming too thick to spread.

Mosquito Repellence Test

A volunteer's forearm was treated with it. Twenty adult Aedes aegypti mosquitoes were kept in a cage with the treated arm. Every hour, the number of mosquito bites was recorded. [17]

Tabel 2:-*Evaluation test results of Herbal Cream*

Parameter	Method used	Observation/result	Inference
Physical appearance	Visual inspection	Semi-solid emulsion with smoot appearance	Acceptable
pH	Digital pH meter	5	Skin Friendly range
Spread ability	Glass slide method	Cream appear easily spreadable on surface	Easily spreadable
Viscosity	Brookfield viscometer	6,000 cP to 8,000 cP	Suitable consistency
Skin irritation test	Patch test on volunteers	No irritation observed	Sate for topical use
Stability	Stored at 4°c, RT, 45°c	No phase separation, stable pH	Physically stable
Repellency duration	Arm-in-cage method	3.5 hours average	Effective short term protection

CONCLUSION

In conclusion, the present review highlights the growing need for safer and more sustainable alternatives to conventional synthetic mosquito repellents. The use of plant-based ingredients such as neem, lemongrass, tulsi, citronella, and eucalyptus demonstrates significant potential in developing effective herbal mosquito repellent formulations. These natural components not only exhibit strong repellent properties but also offer additional benefits such as antimicrobial activity, skin friendliness, and environmental safety.

The formulated herbal cream showed desirable physicochemical characteristics, including appropriate pH, good spreadability, stability, and non-irritant nature, making it suitable for topical application. Furthermore, the incorporation of natural excipients contributed to improved texture, consistency, and shelf life of the product. The evaluation studies confirm that herbal repellents can provide satisfactory protection against mosquito bites while minimizing the risks associated with synthetic chemicals.

Overall, herbal mosquito repellent creams represent a promising, eco-friendly, and cost-effective approach for personal protection against mosquito-borne diseases. Future research should focus on enhancing the duration of protection, standardizing formulations, and conducting large-scale clinical studies to further validate their efficacy and commercial applicability.

REFERENCES

1. Keerthanadevi, N. S., Senthilkumar, K. L., Vasanthan, A., Kowsalya, S., Yuvasri, S., & Santhosh Kumar, M. (2025, July 1). Development and evaluation of a neem oil-based mosquito repellent cream. *Journal of Pharma Insights and Research*.
2. Gupta, H., Kumar, V., Chauhan, T., Patel, R. K., & Dabral, K. (2025, May 14). Formulation and evaluation of herbal mosquito repellent cream. *International Journal of Pharmaceuticals and Health Care Research (IJPHR)*.
3. Kalbande, S. M., Hatkar, A. D., Jaju, S., & Jaybhaye, S. S. (2025, June). Formulation and evaluation of herbal mosquito repellent. *EPRA*

International Journal of Multidisciplinary Research (IJMR).

4. Althowf, M. B., Thasneem, A., Fathima, F. K. P., Nishad, K. M., Baboo, C. R. V., & Sirajudheen, M. K. (2023, June 22). Formulation and evaluation of polyherbal mosquito repellent cream. *World Journal of Pharmaceutical Research*.
5. Mittal, P. K., Sreehari, U., Razdan, R. K., Dash, A. P., & Ansari, M. A. (2011, April). Efficacy of advanced Odomos repellent cream (N, N-diethyl-benzamide) against mosquito vectors. *PubMed*.
6. Lissy, S., Anusree, P., Mariadas, M. P., & Fena, M. (2024, September). Formulation and evaluation of herbal mosquito repellent cream. *International Journal of Research and Analytical Reviews (IJRAR)*.
7. Tulashie, S. K., Adjei, F., John, A., & Addo, E. (2021, December). Potential of neem extracts as natural insecticide against fall armyworm. *ScienceDirect*.
8. Wagh, S. R., Wagh, S. S., & Murkute, P. (2025, April 4). Formulation and evaluation of safe herbal mosquito repellent dhoop sticks. *International Journal of Creative Research Thoughts (IJCRT)*.
9. Ashaq, B., Rasool, K., Habib, S., Bashir, I., Nisar, N., Mustafa, S., Ayaz, Q., Nayik, G. A., Uddin, J., Niwas, S. R., Mugabi, R., & Wani, S. M. (2024, May 28). Insights into chemistry, extraction and industrial application of lemongrass essential oil: A review of recent advances. *NIH*.
10. Baisane, V. V., Salunke, P. M., Chavan, S. N., Sawant, P. S., & Shejwal, S. S. (2025, April 24). Formulation and evaluation of a herbal mosquito repellent cream. *International Journal of Entomology Research*.
11. Maske, R. B., & Patil, K. (2025, June). Formulation and evaluation of herbal face cream with green tea extract. *International Journal of Scientific Development and Research*.
12. Mahajan, V. P., Zawar, G. S., Patil, P. V., Rajput, A. D., & Patil, A. L. (2025, November). Formulation and evaluation of a herbal skincare cream using natural plant-derived ingredients. *Journal of Advance and Future Research*.
13. Baisane, V. V., Salunke, P. M., Chavan, S. N., Sawant, P. S., & Shejwal, S. S. (2025, April 24). Formulation and evaluation of a herbal mosquito repellent cream. *International Journal of Entomology Research*.
14. Banik, B., Barman, J., Dutta, M. P., & Bhowmick, N. (2021, December 1). Development and evaluation of herbal mosquito repellent cream. *Research Journal of Pharmacy and Technology*.
15. Agrawal, S., Haldankar, N., & Jadhav, A. (2018). Formulation of natural mosquito repellent. *International Journal of Advance Research, Ideas and Innovations in Technology*.
16. Yadav, N. P., Rai, V. K., Mishra, N., Sinha, P., Bawankule, D. U., Pal, A., Tripathi, A. K., & Chantaya, C. S. (2014, October 14). A novel approach for development and characterization of effective mosquito repellent cream formulation containing citronella oil. *BioMed Research International*.
17. Joshi, O. S., Ajmire, A. R., Dudhe, A. D., Darne, A. M., & Rathod, U. T. (2025, May). Development of a natural mosquito repellent cream based on *Tagetes* and *Ocimum sanctum* extracts. *International Journal of Advanced Research in Science, Communication and Technology*.