

PREPARATION OF ECO-FRIENDLY MOSQUITO REPELLENT CREAM FROM NEEM OIL AND LEMONGRASS OIL

Bhutambare Vaishali*¹, Bhapkar Ankita*², Zodge Shivani², Momin Sajiya², Ajay Bhagwat¹

¹Assistant Professor, Samarth Rural Educational Institute's, Samarth College of Pharmacy, Bangarwadi, Belhe, Pune-412410.

²Student, Samarth Rural Educational Institute's, Samarth College of Pharmacy, Bangarwadi, Belhe, Pune-412410.

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***Corresponding Author: Bhapkar Ankita**

Assistant Professor, Samarth Rural Educational Institute's, Samarth College of Pharmacy, Bangarwadi, Belhe, Pune-412410.

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ABSTRACT

Diseases spread by mosquitoes, including filariasis, dengue, chikungunya, and malaria, are serious worldwide health issues. After extended usage, synthetic insect repellents on the market may cause allergies, skin irritation, and environmental contamination. In order to create and assess an environmentally friendly mosquito repellent cream employing natural components like Neem oil and lemongrass oil, the current study was conducted. While lemongrass oil offers great protection because it contains citral and other volatile chemicals, Neem oil has insecticidal, antibacterial, and mosquito repellent qualities. Beeswax, borax, methyl paraben, distilled water, and rose water were used in the emulsification process to create the cream. Numerous factors, including physical appearance, pH, homogeneity, spreadability, washability, irritancy, stability, and mosquito repellent effectiveness, were assessed for the produced formulation. The formulation's good consistency, smooth texture, nice odour, adequate spreadability, and strong mosquito repellent activity without irritating skin were all demonstrated by the findings. According to stability tests, the cream didn't change while being stored. According to the study's findings, the herbal repellent cream is safe, biodegradable, economical, environmentally beneficial, and a viable substitute for synthetic repellents.

KEYWORDS: Neem oil, Lemongrass oil, Herbal cream, Mosquito repellent, Eco-friendly formulation, Natural repellents, Essential oils, Herbal cosmetics.

INTRODUCTION

One of the most deadly insects that spread disease to people globally is the mosquito. A number of dangerous and sometimes fatal illnesses, including malaria, dengue fever, chikungunya, yellow fever, filariasis, Japanese encephalitis,

and Zika virus infection, are spread by them. The World Health Organization (WHO) reports that mosquito-borne illnesses afflict millions of people each year, particularly in tropical and subtropical nations. These illnesses have expanded quickly due to a number of factors, including increased urbanisation, poor sanitation, stagnant water buildup, climate change, and insufficient mosquito control measures.^[1-2]

In addition to causing irritation, itching, redness, and allergic responses, mosquito bites can spread infections that can cause serious disease or even death. As a result, preventing mosquito bites is regarded as one of the most crucial wellness precautions. Mosquito nets, coils, vaporisers, sprays, creams, lotions, and pesticides are some of the techniques used to control mosquitoes. Because they offer direct protection when applied to the skin, topical insect repellents are the most popular among them.

Synthetic compounds like DEET (N,N-Diethyl-meta-toluamide), dimethyl phthalate, permethrin, and allethrin are typically included in commercial insect repellents. These substances work well to keep mosquitoes away, but long-term usage can have a number of negative consequences, such as skin irritation, allergies, respiratory issues, headaches, nausea, neurotoxicity, and contamination of the environment. Children and sensitive people may also be impacted by ongoing exposure to synthetic repellents. Furthermore, synthetic chemicals might cause ecological imbalance since they are not biodegradable.

Table no. 1: Plant Profile Neem

Particulars	Details
Scientific Name	<i>Azadirachta indica</i>
Common Name	Neem
Family	Meliaceae
Biological Source	Dried seeds and leaves of <i>Azadirachta indica</i>
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Sapindales
Genus	<i>Azadirachta</i>
Species	<i>Indica</i>
Part Used	Seed oil
Geographical Source	India, Sri Lanka, Bangladesh, Tropical regions
Active Constituents	Azadirachtin, Nimbin, Salannin, Gedunin
Chemical Nature	Limonoids and Terpenoids
Color	Yellowish-brown
Odor	Strong characteristic Odor
Uses	Mosquito repellent, antifungal, antibacterial, insecticidal

Environmentally friendly insect repellent formulas are becoming more popular as people become more conscious of the negative consequences of synthetic chemicals. Herbal repellents are said to be more cost-effective, non-toxic, safe, biodegradable, and ecologically benign.

Substances found in medicinal plants have insecticidal, antibacterial, and mosquito-repelling properties. Because of their strong odour and volatile nature, essential oils derived from aromatic herbs are very efficient in preventing mosquitoes from finding hosts.

Among the most popular natural ingredients for treatments that repel mosquitoes are neem and lemongrass oils. The seeds of *Azadirachta indica*, a medicinal plant frequently used in traditional Ayurvedic treatment, are used to make

neem oil. Azadirachtin, nimbin, salannin, and gedunin are among the active ingredients in neem oil that have potent insecticidal, antifungal, antibacterial, antiviral, and mosquito-repelling qualities. Neem oil reduces mosquito activity by interfering with insects' eating and reproductive habits. Its therapeutic and skin-protective qualities are also well-known.

Citral, citronellal, geraniol, and limonene are among the volatile chemicals found in lemongrass oil, which is derived from *Cymbopogon citratus*. These substances create a strong citrus scent that successfully keeps mosquitoes and other insects away. Because of its attractive scent and inherent insecticidal properties, lemongrass oil is frequently utilised in herbal cosmetics, aromatherapy, and insect repellent products. Neem and lemongrass oils work in concert to repel mosquitoes, improving protection and user acceptance.^[11-12]

PLANT PROFILE

Table no. 2: Plant Profile Of Lemongras.

Particulars	Details
Scientific Name	<i>Cymbopogon citratus</i>
Common Name	Lemongrass
Family	Poaceae
Biological Source	Leaves of <i>Cymbopogon citratus</i>
Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida
Order	Poales
Genus	<i>Cymbopogon</i>
Species	<i>citratus</i>
Part Used	Leaves and essential oil
Geographical Source	India, Sri Lanka, Southeast Asia, Tropical regions
Active Constituents	Citral, Geraniol, Citronellal, Limonene
Chemical Nature	Essential oils and Terpenes
Color	Pale yellow
Odor	Strong lemon-like aroma
Uses	Mosquito repellent, perfumery, aromatherapy

MATERIAL & METHOD

Materials

The materials used for the preparation of eco-friendly mosquito repellent cream were collected from approved chemical and herbal suppliers. All chemicals and reagents used in the study were of analytical grade.

Table 3: List of Materials Used.

Sr. No.	Ingredients	Use
1	Neem Oil	Herbal mosquito repellent agent
2	Lemongrass Oil	Herbal mosquito repellent agent
3	Beeswax	Stiffening agent
4	Liquid Paraffin	Oil phase and emollient
5	Borax	Emulsifying agent
6	Methyl Paraben	Preservative
7	Distilled Water	Vehicle
8	Rose Water	Fragrance and soothing agent

METHODS

Method of Preparation

The herbal mosquito repellent cream was prepared by using the emulsification method. The formulation was prepared by separately preparing the oil phase and aqueous phase followed by mixing with continuous stirring.

Formulation Table

Table 4: Formula for 20 MI Batch.

Sr. No.	Ingredients	Quantity
1	Liquid Paraffin	9 mL
2	Beeswax	3 g
3	Borax	2 g
4	Methyl Paraben	2 g
5	Neem Oil	3 mL
6	Lemongrass Oil	6 mL
7	Distilled Water	q.s.
8	Rose Water	2 mL

Procedure

Step 1: Preparation of Oil Phase

Liquid paraffin and beeswax were taken in a clean beaker and heated on a water bath at approximately 70–75°C until complete melting of beeswax occurred. Neem oil and lemongrass oil were then added to the oil phase with continuous stirring.

Step 2: Preparation of Aqueous Phase

In another beaker, distilled water was heated to the same temperature. Borax was dissolved completely in the heated distilled water. Methyl paraben was added as a preservative and mixed thoroughly.

Step 3: Emulsification

The aqueous phase was slowly added to the oil phase with continuous stirring. Stirring was continued until a smooth and uniform emulsion was formed.

Step 4: Addition of Fragrance

Rose water was added to the prepared cream after cooling slightly. The mixture was stirred continuously to obtain a homogenous cream.

Step 5: Packing and Storage

The prepared cream was transferred into a clean airtight container, properly labeled, and stored at room temperature for further evaluation studies.

RESULT & DISCUSSION

1. pH Test

Observation

Parameter	Specification	Observation
pH	5.6	5.3

Result- The pH of the prepared cream was found to be 5.3, which is suitable for topical application and compatible with skin pH.

2. Viscosity test

Observation

Parameter	Specification	Observation
Viscosity	211 cps	209 cps

Result- The formulation showed satisfactory viscosity, indicating good consistency and ease of application.

3. Appearance

Observation

Parameter	Specification	Observation
Appearance	Smooth, Semisolid	Smooth, Semisolid

Result- The prepared cream showed smooth texture and semisolid consistency without any phase separation.

4. Odor evaluation

Observation

Parameter	Specification	Observation
Odor	Lemony	Lemony

Result- The cream possessed a pleasant lemon-like odor due to the presence of lemongrass oil.

5. Grittiness Test

Observation

Parameter	Specification	Observation
Grittiness	Free from grittiness	Free from grittiness

Result- The cream was found free from gritty particles and showed smooth texture.

6. Spreadability Test

Observation

Parameter	Specification	Observation
Spreadability	Smooth	Smooth

Result- The cream showed good spreadability and was easy to apply uniformly on skin.

7. Homogeneity Test

Result- The formulation showed good homogeneity with uniform consistency and no lumps.

8. Washability Test

Result- The cream was easily washable with water and left no oily residue.

9. Irritancy Test

Result- No irritation, redness, or allergic reaction was observed after application.

10. Stability Study

Result- The formulation remained stable without any significant changes during storage period.

CONCLUSION

The present study successfully formulated and evaluated an eco-friendly mosquito repellent cream using Neem oil and lemongrass oil as natural active ingredients. Utilising appropriate excipients such as beeswax, borax, liquid paraffin, methyl paraben, distilled water, and rose water, the formulation was made utilising the emulsification process. The goal of the created cream was to offer ecologically friendly, biodegradable, safe, and efficient protection against mosquito bites. Smooth texture, semisolid consistency, nice lemon-like odour, acceptable homogeneity, and outstanding spreadability were among the favourable physicochemical features of the developed formulation. The cream's pH was determined to be skin-compatible, suggesting that topical administration of the formulation is safe and won't irritate the skin. It was also discovered that the cream's viscosity was suitable, guaranteeing simple application and even dispersion over the skin's surface. The cream's ease of washing with water and lack of grittiness increased consumer acceptance and convenience. The formulation's ability to repel mosquitoes showed that neem and lemongrass oils had strong natural repellent qualities. Azadirachtin and related chemicals in neem oil supplied insecticidal and antibacterial activity, while citral and other volatile components in lemongrass oil produced a potent repelling effect and attractive scent. The cream's overall ability to repel mosquitoes was improved by the combined action of both oils. According to stability experiments, the formulation did not exhibit phase separation, colour change, or an unpleasant odour when being stored. The irritancy test revealed no evidence of allergic responses or skin irritation, demonstrating the herbal formulation's safety. The herbal mosquito repellent lotion is safe, effective, affordable, skin-friendly, and environmentally friendly, it can be concluded. The study emphasises the value of herbal constituents in natural and sustainable healthcare products and promotes their usage as viable substitutes for synthetic insect repellents.

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