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## Research Paper

# Formulation And Evaluation of Herbal Mosquito Repellent Cream

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### ABSTRACT

Mosquito management and personal protection against mosquito bites is one of the most important techniques to prevent the spread of infectious illnesses. Because of the emergence of resistance, crossresistance, and potential toxicity risks connected with synthetic insecticides, as well as their escalating prices, interest in plant-based solutions has resurfaced in recent years. Most mosquito repellents on the market today are chemical-based and hazardous to the skin and nervous system, causing rashes, swelling, eye irritation, and other health issues. The smoke from synthetic pyrethroid mosquito coils is still disliked by the majority of people. As a result, herbal insect repellents were chosen over chemical repellents. Essential oils from a variety of plant species, as well as combinations of essential oils, have been shown to be excellent mosquito and insect repellents. Plant-based repellants, which are safe and biodegradable alternatives to synthetic chemical repellants for mosquito control, have grown in popularity as a result of their accessible availability and lower negative environmental effect. As a result, efforts have been undertaken to develop innovative formulations for mosquito repellent sticks that comprise fixatives and a blend of essential oils. Azadirachta indica, Cymbopogon nardus, Eucalyptus globulus, Cymbopogon Citrullus, Cymbopogon martini, Mentha piperita, Ocimum basilicum, Rosmarinus officinalis, Syzygies aromaticum, Cinnamomum Zeylanicum, Syzygium aromaticum, Cinnamomum Zeylanicum, Rosmarinus officinalis. Filler, binder, burning agent, adhesives, odour enhancer, and other supporting substances were used to create them singly and in various combinations. When compared to other repellent essential oils, compositions including Cymbopogon citrullus, Azadirachta indica, and Eucalyptus globulus essential oils had the most promising efficacy, demonstrating 80-95 percent repellency. When compared to other formulations, the combinations containing Azadirachta indica demonstrated longer burning and repellency. The components employed in virtually all of the formulations in this study were herbal-based and environmentally safe. As a result, it has no adverse effects on inhalation. Texture, effectiveness, and stability of the same formulations were all tested. The current study shows that essential oils from

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medicinal plants may be used in mosquito repellent compositions...

## INTRODUCTION

To provide specific nutritional or cosmetic benefits for the diagnosis, treatment, or mitigation of human or animal sickness, herbal formulations are dosage forms that comprise one or more raw or processed herbs in preset proportions. Since herbal preparations are manufactured by extracting the active components from the biological sources of herbal plants, they are said to be more effective and to have less side effects than any other synthetic chemical treatments.[1] Numerous diseases spread by mosquitoes have been documented in our nation. Each year, mosquito-borne diseases that are mostly spread by these arthropod vectors affect millions of people worldwide.[1]

Because they are known to carry a number of viruses, bacteria, and protozoa that can cause fatal illnesses including dengue, chikungunya, malaria, yellow fever, and Japanese encephalitis, *Aedes*, *Culex*, and *Anopheles* mosquitoes represent a serious threat to public health.[2] Every day, more people use insect repellents due to the increasing prevalence of mosquito-borne illnesses. In the nation, repellents such as vaporizing mats, sprays, mosquito coils, and liquid vaporizers are often employed. Numerous plant extracts have been shown to be highly effective in keeping mosquitoes away and to have coquinoidal properties against mosquito vectors. Neem extract can effectively suppress mosquito populations in place of synthetic insecticides by killing *Aedes* pupae at very low doses.[3]

The most popular natural repellents in the world are made by *Cymbopogon*. [2-3] Additionally, clove oil has insecticidal and repellent properties against a wide variety of pest species. As a result, three distinct plant leaves *Tulsi*, lemongrass, and neem leaves have been

chosen for use in this study as the best environmentally friendly method of controlling mosquitoes. A chemical that is applied to skin, clothes, or other surfaces to deter mosquitoes from landing there is known as a mosquito repellent. Their active component serves as the sole means of keeping mosquitoes away by obstructing their ability to detect lactic acid and carbon dioxide, which are generated when a person perspires.[4] The aim of present study was to formulate a herbal cream using Neem extract, Essential oils of Clove, *Tulsi* & Lemongrass as active ingredients for a potent mosquito repellent property. Mosquitoes are found in tropical regions and comprise over 3500 different species. The primary mosquito species that act as vectors for numerous illnesses include *Anopheles* (filariasis, malaria), *Culex* (Japanese encephalitis, West Nile, chikungunya), and *Aedes* (chikungunya, dengue fever). Both during the day and at night, mosquitoes are terrible. [5]

As the weather drops, they start looking for warm spots because they live outside. The mosquito season typically begins in the summer and lasts into the fall. Mosquito bites can be more than just bothersome or uncomfortable. It does not kill mosquitoes, but it can cause illness and, in extreme situations, even death. Repellents work by making people less appealing to mosquitoes, which lessens the likelihood that they will scent humans. When used duly, natural oil painting-grounded mosquito repellents are safe for grown-ups and children over the age of two months, according to the Environmental Protection Agency. There are multitudinous repellents on the request that effectively shield off mosquitoes but are bad for your health since they contain the poisonous chemical. [4]

Mosquito-borne diseases continue to be a major cause of death and illness.[1] Malaria remains a serious global public health concern, despite decades of malaria control efforts, with 3.3



billion people at risk in 106 tropical and subtropical countries and territories.[2] Low birth weight, stillbirths, and early infant death are all important causes of maternal and childhood morbidity and mortality in Sub-Saharan Africa.[3] More than 50 *Anopheles* mosquito species are known to spread malaria through the bite of infected female *Anopheles* species.[4] There is currently no effective anti-malarial vaccine available for prophylaxis, and no acceptable preventative intervention other than vector control.[5]

As a result, one of the most effective ways to prevent illness incidence is to protect yourself against mosquito bites. Mosquito repellents have previously been acknowledged as part of a broader integrated insect-borne disease control approach.[6] The bulk of commercial repellents use chemicals such as N, N-diethyl-metatoluamide (DEET), Allethrin, N, N-diethyl mendelic-acid amide, and Dimethyl-phthalate.[1] Chemical repellents have been found to be hazardous to population health and should be used with caution due to its negative effects on synthetic fabric and plastic, as well as toxic reactions like allergy, dermatitis, and cardiovascular and neurological side effects, which were reported frequently after misuse.[4] The increasing use of chemically generated synthetic repellents for mosquito control has altered natural ecosystems, repesticide resistance, mosquito population comeback, and harmful impacts on nontarget species. [4,7] -10]

As a result, employing natural mosquito repellent products as a substitute for developing new eco-friendly repellents might be a win-win option for reducing the negative impacts on the Human health and the environment.

Because of their availability of phytochemical compounds that are both harmless and biodegradable into non-toxic by-products that might be investigated for insecticidal and mosquito repellent characteristics, plant-based

repellents have reemerged in popularity in recent years .

Many research have shown evidence of plant extracts or essential oils having repellent properties against malaria vectors all throughout the world. The goal of this systematic study was to determine whether plant-based repellents can be depended on to offer long-term and predictable protection from *Anopheles* mosquito species without generating negative health consequences.[8]

All suitable research on the repellency effects of plant-based repellants against *Anopheles* spp. and other mosquito spp. Were included in this systematic review .

## **Mosquitoes born disease:**

### **1. Malaria.**

Malaria is transmitted via a female *Anopheles* mosquito bite. Malaria is a protozoal infection of red blood cells that is the world's most frequent parasitic illness. There are 172 *Plasmodium* species, the most majority of which only infect birds, reptiles, and nonhuman mammals. *Falciparum*, *vivax*, *oval*, and *malaria* are the four *Plasmodium* species that routinely infect people and cause clinical illness.[9]

### **2. Dengue.**

Dengue fever is a mosquito-borne sickness that has recently returned over the world. Dengue fever is a contagious disease that affects people all around the world. DENVs 1–4 cause dengue fever. It is a mosquito-borne sickness transmitted to humans mostly by female *Aedes* mosquitos. The disease is primarily found in tropical and subtropical regions, putting roughly a third of the world's largest population at risk.[10]

### **3. Chikungunya fever.**

The name "chikungunya" comes from a Makonde phrase that means "to bend up" or "to become



deformed," referring to the bent posture of those who are infected. The Chikungunyavirus (CHIKV) causes Chikungunya fever (CHIKF). Chikungunya is an alpha viral infection that belongs to the Gaviidae family. CHIKV, which has symptoms that are similar to dengue illness and Zika, is spread in two cycles: urban and sylvatic. The urban cycle describes transmission from human to human, whereas the sylvatic cycle describes transfer from animal to mosquito to human.[11]

#### 4. Zika virus.

The Flaviviridae virus family includes the Zika virus. Aedes mosquitoes that are active during the day, such as Aedes aegypti and Aedes albopictus, spread the Zika virus. It takes its name from the Zika Forest in Uganda, where the virus was first found in 1947. The Zika virus belongs to the same genus as dengue disease, yellow fever, Japanese encephalitis, and West Nile virus. Like a weak form of dengue fever, the Zika virus infection, also known as Zika fever or Zika virus illness, generally has no or few symptoms. While there is no particular therapy for the symptoms, paracetamol (acetaminophen) and rest may assist.[12]

#### 5. Yellow fever

Yellow fever (YF) is a mosquito-borne flavivirus that causes high-fatality epidemics. The predominant vectors are Aedes species, whereas key forest species in South America include Homologues and Sabetha's, and nonhuman primates act as the reservoir. Fever, nausea, vomiting, and stomach discomfort are all symptoms of YF virus infection. In 20% of cases, the symptoms escalate to jaundice, hepatic and renal failure, and bleeding.[13]

## MATERIAL AND METHODOLOGY

### Material

#### 1.Neem

- **Biological Name:**Azadirachta indica
- **Family:**Meliaceous
- **Common Names:** Neem
- **Geographical Source**

Widely found in tropical and subtropical regions: India, Pakistan, Bangladesh ,Sri Lanka



Fig.no.1.Neem

- **Macroscopic Characters**

Leaves

Compound, pinnate

Leaflets: lance-shaped, serrated margins

Colour: dark green

Taste: bitter

Bark

Rough, fissured

Color: greyish-brown outside, reddish inside

Taste: bitter and astringent

Seeds

Oval, smooth

Contain oil (neem oil)

- **Microscopic Characters (Leaf)**

1. Epidermal cells with stomata
2. Calcium oxalate crystals
3. Vascular bundles
4. Trichomes (few)

- **Chemical Constituents**

1. Azadirachtin (major active compound)
2. Nimbin
3. Nimbidin
4. Gedunin
5. Salannin

6. Flavonoids and tannins

• **Pharmacological Actions**

1. Antibacterial
2. Antifungal
3. Antiviral
4. Anti-inflammatory
5. Antimalarial
6. Insect repellent

• **Uses**

1. Treatment of skin diseases (acne, eczema)
2. Dental care (toothpaste, mouthwash)
3. Used in mosquito repellents
4. Blood purifier in traditional medicine
5. Wound healing.

**2. Borex (Cera Alba)**

• **Biological Source:** - Borax is naturally occurring mineral obtained from deride lakes

• **Family:** - Inorganic compound (*Boron family*)

• **Common Name**

Borax

Sodium borate

• **Description**

1. Appearance: White or colorless crystalline powder
2. Odor: Odorless
3. Taste: Alkaline, slightly bitter
4. Solubility: Soluble in water, insoluble in alcohol
5. Nature: Soft, greasy feel
6. When heated, it swells and forms a glassy mass (known as borax bead test)

• **Chemical Constituents**

1. Sodium, boron
2. Oxygen
3. Water of crystallization (10 molecules)



**Fig. No. 2 Borax**

• **Medicinal properties.**

1. Antiseptic: prevents infection by inhibiting bacterial growth
2. Antifungal: Effective against fungal in condition like candidates
3. Anti-inflammatory: Helps reduce inflammation in minor wounds or infection

• **Pharmacological / Functional Properties.**

1. Emollient → Softens and smoothens skin
2. Protective → Forms a barrier to prevent moisture loss
3. Mild anti-inflammatory
4. Antibacterial (mild)
5. Stabilizing agent → Improves consistency of formulations
6. Thickening agent → Provides structure to creams and ointments

• **Application in Herbal Cream.**

1. Beeswax is widely used in herbal creams such as:
2. Base material → Gives semi-solid consistency
3. Emulsifying aid (especially with borax)
4. Moisture barrier → Prevents skin dryness
5. Stiffening agent → Improves texture and stability
6. Enhances spread ability

### 3. Liquid Paraffin

- **Biological Source :-** Derived from petroleum through distillation and purification.
- **Family:** - Hydrocarbon, (Inorganic origin does not form plant family)
- **Common names:-** Mineral oil, liquid paraffin
- **Description**
  1. Clear, colorless, transparent, oily liquid
  2. Odorless and tasteless
  3. Composed of highly refined mineral oil
  4. Insoluble in water but soluble in organic solvents
  5. Smooth, greasy feel



Fig. No. 3 Liquid Paraffin.

### Medicinal Properties

1. Emollient – softens and smoothens skin
2. Lubricant – reduces friction
3. Laxative – used in constipation (lubricates intestines)
4. Protective (occlusive agent) – forms a barrier on skin to prevent moisture loss

### • Application in Mosquito Cream

1. Liquid paraffin is widely used in herbal mosquito repellent creams such as:
2. Base (vehicle) → helps dissolve active ingredients like neem oil, eucalyptus oil
3. Emollient → keeps skin soft and prevents dryness
4. Spreading agent → ensures uniform application on skin

5. Moisture barrier → improves skin hydration and increases product effectiveness

### 4. Rose Water

- **Biological Source:** - Rose water is obtained by steam distillation of fresh petals of Rosa damascene
- **Family** Rosaceae
- **Common name:** Rose water
- **Description**
  1. Clear, colorless liquid
  2. Pleasant, sweet floral fragrance
  3. Slightly astringent taste
  4. Highly volatile and aromatic
- **Chemical constituents: -**
  1. Citronellol
  2. Geraniol
  3. Nerol
  4. Phenyl ethyl alcohol (major fragrance component)



Fig. No. 4. Rose Water

### • Medicinal Properties: -

1. Antiseptic – prevents microbial growth
  2. Anti-inflammatory – reduces irritation and redness
  3. Cooling effect – soothes skin
  4. Antioxidant – protects skin from damage
- **Application in Mosquito Cream: -**
    1. Used as a natural base and fragrance enhancer
    2. Provides cooling and soothing effect on skin after application

3. Helps reduce skin irritation caused by mosquito bites
4. Improves spread ability and texture of cream
5. Masks strong odor of active repellent agents (like neem or eucalyptus oil)

### 5. Beeswax (Cera Alba) .

- **Biological Source:** - Beeswax is a natural wax obtained from the honeycomb.

- **Family:**-Apidae

- **Common Name:**-Beeswax, White wax (Cera alba), Yellow wax (Cera flava)

#### ➤ **Type**

1. Natural wax
2. Animal origin pharmaceutical aid
3. Lipid-based excipient

#### ➤ **Description (Morphology)**

1. Color: Yellowish (natural) or white (bleached)
2. Odor: Pleasant, honey-like smell
3. Taste: Faintly sweet
4. Texture: Hard, brittle at low temperature; softens on warming
5. Melting Point: ~62–65°C
6. Solubility: Insoluble in water, soluble in organic solvents like chloroform and ether

#### ➤ **Chemical Constituents**

1. Beeswax is a complex mixture of
2. Esters (70–75%) → Mainly myricyl palmitate
3. Hydrocarbons (12–15%) → Pentacosane, heptacosane
4. Free fatty acids (12–14%) → Cerotic acid, palmitic acid
5. Alcohols → Myricyl alcohol
6. Trace amounts of vitamin A and aromatic compounds



Fig. No. 5. Beeswax .

#### ➤ **Pharmacological / Functional Properties**

1. Emollient → Softens and smoothens skin
2. Protective → Forms a barrier to prevent moisture loss
3. Mild anti-inflammatory
4. Antibacterial (mild)
5. Stabilizing agent → Improves consistency of formulations
6. Thickening agent → Provides structure to creams and ointments

#### ➤ **Application in Herbal Cream**

1. Beeswax is widely used in herbal creams such as:
2. Base material → Gives semi-solid consistency
3. Emulsifying aid (especially with borax)
4. Moisture barrier → Prevents skin dryness
5. Stiffening agent → Improves texture and stability
6. Enhances spread ability

#### ➤ **Used in Moisturizing creams: -**

1. Mosquito repellent creams
2. Cold creams
3. Herbal ointments

### **Methodology**

#### **Preparation of Herbal Extract**

##### 1. Neem Extract

Gather fresh Neem leaves and wash them with distilled water. Dry the leaves in a hot air oven,

then grind them into powder. Take 5g of Neem powder and mix it with 20ml of mis solvent. Heat the Mixture in a water bath at 100°C for 5 to 10 minutes, then filter it to obtain a clear solution.

### ➤ Formulation Table

**Table. No.1 Formulation Table**

Sr.No	Ingredients	F1	F2	F3
1	Neem Extracts	2-3 Drop	3-4 Drop	3-4 Drop
2	Nilgiri Oil	5 ml	5.7 ml	6 ml
3	Lemon Oil	2 ml	2.5 ml	3 ml
4	Liquid Paraffine	1 ml	1.5 ml	2 ml
5	Beeswax	2-3 gm	3-4.5 gm	5-6 gm
6	Rose Water	2 ml	3 ml	4 ml
7	Borax	0.5-1 gm	1-1.5 gm	1.5-2 gm
8	Methyl Paraben	0.5 gm	1 gm	1.5 gm
9	Distal Water	8 ml	10 ml	12 ml
10	Glycerin	1 ml	2 ml	3 ml

### ➤ Evaluation parameters

#### 1.Physical Parameter

**Table.No.2 Physical Parameter**

Sr. No	Parameters	F1C	F2C	F3C
1	Color	Faint Yellow	Yellow	Yellow
2	Order	Pleasant	Pleasant	Pleasant
3	Texture	Smooth	Smooth	Smooth
4	State	Semi-solid	Semi-solid	Semi-solid

#### 3. Irritancy Test

Mark the area (1cm) the left-hand dorsal surface. Then the cream was applied to the area and Exterminated. After intervals up to 24hr, it is checked for irritant effect, erythema and edema If any, then reported.



**Fig. No. 1 Irritancy Test**

#### 4.Spreadability Test

Spread ability carried out for all those formulations That is F1C, F2C and F3C The less time take for separation of Both the better spread ability they're for according to the statement F1C better spread ability.

m- weight tied to upper slide

l= length moved by slide

time taken to slip (sec)

#### 5.pH Test

The pH meter underwent calibration using Take 5 gm of cream Dispersed it in 20 ml spilled water to check it pH using digital pH meter (5.82)



**Fig. No. 2 pH Test**

#### 6.Phase separation Test

Prepare cream is kept instantly close container at room temperature away from sunlight and observed for 24 hrs. phase (47)



Fig.No.3 Phase Separation

## 8. RESULTS AND DISCUSSION

The three formulations F1C F2C F3C showed good appearance ph. advocate vicinity, phase separation was observed. Also, the formulations F1C, F2CF3C showed no and irritation during infancy study and they were easily washable. All the Emulation's F1C, F2C. F3C were stable Temperature.

From the result of test conducted being prepared so that yellow color is spread evenly in the am that prove. The cream preparation made has & type of oil in water, where this type of has the advantage is more easily spread on the surface of skin on not sticky and easily by washing. The purpose preparation of test is to know the stability of the cream preparation made The Formulation can be detected in several ways in the physical appearance, color, order, State and texture of the preparation.

### Evaluation Parameters

#### 1. Physical Parameter

Table.No.3.Physical Parameter

Sr. No	Parameters	F1C	F2C	F3C
1	Colour	Faint Yellow	Yellow	Yellow
2	Order	Pleasant	Pleasant	Pleasant
3	Texture	Smooth	Smooth	Smooth
4	State	Semi-solid	Semi-solid	Semi-solid

#### 2. Irritancy Test

Table.No.4.Irritancy Test

Sr.no	Parameters	Irritancy
1	F1C	Nil
2	F2C	Nil
3	F3C	Nil

#### 3. pH Test

Table.No.5.pH Test

Sr.No	Formulation	pH
1	F1C	5.2
2	F2C	5.8
3	F3C	5.4

#### 4.Phase Separation Test

Table.No.6.Phase Separation Test

Sr.No	Formulation	Phase Separation Test
1	F1C	No Phase Separation
2	F2C	No Phase Separation
3	F3C	No Phase Separation

## SUMMARY AND CONCLUSION

### ➤ Summary

Herbal mosquito repellent cream is a topical formulation made from natural plant-based ingredients used to protect the skin from mosquito bites. Unlike synthetic repellents (like DEET), herbal creams are considered safer, eco-friendly, and less toxic.

These creams mainly contain essential oils and plant extracts such as neem oil, eucalyptus (nigiri) oil, citronella oil, and lemon oil. These ingredients have insect-repellent, antimicrobial, and soothing properties, which help in preventing mosquito bites and reducing skin irritation.

The formulation typically includes Oil phase (e.g., beeswax, stearic acid), Aqueous phase (e.g., water, rose water), Active herbal ingredients (e.g., neem oil, eucalyptus oil), Preservatives (e.g., methylparaben), Humectants (e.g., glycerin).

The cream works by masking human odor and producing a smell that repels mosquitoes. Evaluation of the formulation is done using parameters like pH, irritancy test

## CONCLUSION

Formulation herbal Skin for wound Healing was successfully developed that met the pharmaceutical characteristics. The Neem, Nigiri oil, lemon oil, the cream showed purpose effects, and all herbal ingredients were used showed different significant. Based on the result we can say that all formulation F1C, F2C and F3C were stable temperature and can be safely used on the skin. Therefore, according to statement F1C is better Formulation than F2C and F3C of Formulation of herbal cream. The present focuses on the potential of herbal extracts from medicated purpose. The uses of cream have been increased in many folds in personal care system. The uses bioactive Ingredient influence biological function of skin and provide nutrients Necessary for the healthy skin. The prepared formulation showed good spread ability, no evidence of phase separation and good constancy during study period. The prepared herbal cream has the best properties and has nutritional value using Less chemical which protects the skin from the various skin problems since the cream was prepared by using simple Ingredients and simple method, so The Cream is also economical.

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