



# FORMULATION OF AN EFFECTIVE MOSQUITO-REPELLENT TOPICAL PRODUCT FROM LEMONGRASS OIL

Sourav Kumar\*, Simran, Sujata Thakur, Ashima Chandel, Dr Rajesh Gupta

Sri Sai College of Pharmacy, Badhani, Pathankot (Punjab), India

## ABSTRACT

Malaria is estimated to be prevalent in 104 countries and territories and needs its control. Several plant species essential oils include hydrocarbon combinations that have been discovered to be effective insect deterrents. Monoterpenoids, which make up the majority of components, are antileukemic to plant and animal tissues, impairing functionality of the tissues. A primary ingredient in commercially available repellents is an essential oil from the species *Cymbopogon nardus*, *Eucalyptus maculata*, *Cymbopogon excavatus*, *Mentha piperita*, or *Azadirachta indica*. These components' brittleness has led to development of novel formulations, the use of adhesive like vanillin, or due to their brief duration of effect, essential oil plants are often combined as repellents. Due to their accessibility and fewer detrimental effects on the environment, plant-based insecticides have become more and more popular as alternatives to conventional insecticides. The article's goal was to evaluate studies on the potency of essential oils as insect repellents.

**KEYWORDS:** Essential oil, insect repellent, pesticide.

## INTRODUCTION

Worldwide, insect-transmitted illnesses continue to be a leading cause of illness and demise. Each year, mosquitoes alone infect more than 700 million people with an illness<sup>1</sup>. According to research, malaria kills over 3 million people annually, including one kid every 30 seconds<sup>2</sup>. No region of the globe is immune to the hazards associated with insect-borne illnesses, although tropical and subtropical climates now provide a bigger health threat. Effective insect repellents are essential given the danger posed by arthropod-transmitted illnesses and related morbidity and death. Avoiding infection and applying insect repellents are the best ways to protect a person from bites of ticks, mites, lice, or mosquitoes<sup>3</sup>. Less frequently, it may be used to keep insects out of a space like packing to keep stored goods from being infested. The only practical approach to avoid getting bitten by insects in certain situations may be to apply insect repellent to the skin<sup>4</sup>. People use synthetic chemicals-based mosquito repellents to rescue themselves from

mosquito bites but instead develop serious skin irritation, erythema, desquamation, or bullae formation problems and a single bite from an infected arthropod can caused in the transmission of disease. It is crucial to know which repellent product can be trusted to provide predictable and prolonged protection<sup>5</sup>. Commercially insect repellents may be divided into two categories namely synthetic chemicals and plant-derived essential oils. The best-known chemical insect repellent is N-diethyl-m-toluamide, now called N-diethyl-3-methyl benzamide<sup>6</sup>. Before Second World War, there were only four principal repellents oil citronella, dimethyl phthalate, Indalone and Rutgers 612. Other military repellent formulae for use on clothing were developed during the war, but they all failed to provide desired protection for military personnel deployed around the world<sup>7</sup>. In 1956, Other military repellent formulae for use on clothing were developed during the war, but they all failed to give desired shielding for military personnel deployed around the world and the United States government had screened more than 20,000 possible chemicals that ward off mosquitoes<sup>8</sup>. Several substances have been tested for their ability to repel, but none have achieved the same level of commercial success as DEET. The aerial portion of *Cymbopogon citratus* is used to produce the essential oil known as lemongrass oil. The plant's ethnobotanical and therapeutic use has received widespread recognition<sup>9</sup>.



**Fig: 1 Mosquito Repellent**

Mosquitoes have long been implicated as the source of some factors that impact people. Mosquitoes, which make up over 3500 species worldwide, are not just found in tropical and subtropical areas. *Anopheles* (malaria, filariasis), *Aedes* (yellow fever, dengue, chikungunya), or *Culex* are the main genera that transmit infections that cause human illness (West Nile, Japanese encephalitis, filariasis). A female mosquito consumes blood several times throughout her lifespan as a source of protein to finish the development of its eggs<sup>10</sup>. The pathogens complete an essential stage of their life cycle by being injected into the host animal through the saliva, where they may then proliferate in the salivary glands of the mosquito<sup>11</sup>. As a result, female mosquitoes are ideally suited as carriers of several blood-borne infections and agents of fatal human illnesses<sup>12</sup>. Malaria has long been regarded as one of the main causes of mortality in India. According to history, malaria had its maximum prevalence in India in the 1950s, when there were an estimated 75 million cases and 0.8 million fatalities annually<sup>13</sup>. *Plasmodium vivax* Grassi or Feletti, *Plasmodium malariae* Feletti and Grassi, *Plasmodium ovale* Stephens, and *Plasmodium falciparum* Welch are the protozoal parasites that cause malaria and are spread by *Anopheles* mosquitoes. According to studies, some conditions must be met for any type of malaria to become endemic in a particular region. These conditions include the existence of a significant number of competent anopheline mosquitoes that have a sufficient preference for human blood as well as

an uncover human population that contains a sufficient number of malaria carriers or susceptible people for the chain of infection to persist<sup>14</sup>. Essential oils are secondary metabolites produced by aromatic plants and volatile, naturally occurring, complex molecules with a strong odour. They are soluble in lipids, volatile, hardly ever coloured, and liquid. organic solvents that often have densities lower than those of water. Among higher plants, there are 17,500 different species of aromatic plants. Among the 3,000 essential oils that have been identified, 300 have economic significance for the pharmaceutical, cosmetic, and perfume sectors in addition to having pesticidal properties. Essential oils are used in nature to protect plants against herbivores and microorganisms by acting as insecticides, fungicides, antibacterials, and antiviral agents their desire for such plants is being diminished. Additionally, they might draw some insects to help pollen and seed dispersal or deter unwelcome ones. Despite their widespread usage and our familiarity with them as scents, the appeal of natural goods like essential oils makes it crucial to better understand their mode of biological activity to create new usage in human health, agriculture, or environment. Few of them serve as effective substitutes for or extensions of synthetic chemical industry products while exhibiting fewer unwanted side effects<sup>15</sup>.

## **MOSQUITO REPELLENT TYPES AND RECOMMENDATIONS<sup>16</sup>:**

### **1. DEET**

A trustworthy and powerful insect repellent is DEET. Since 1957, the substance has been used in daily life. The repellent is offered in lotion, spray, and many more forms, and it is sold under several brand names.

### **2. IR-3535**

The insect repellent IR-3535 is used to keep mosquitoes, deer ticks, and biting flies away. For individuals looking for a non-DEET solution, it has been around for a while in Europe and is anticipated to offer long-lasting protection.

### **3. Picaridin**

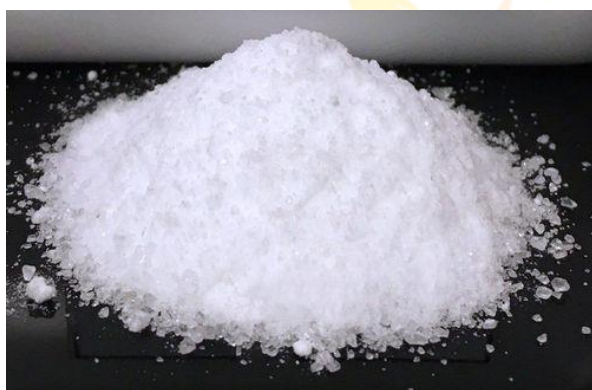
Similar to a 10% concentration of DEET, picaridin, also known as KBR 3023, is a potent substitute for DEET-containing treatments that offers long-lasting protection against mosquito bites. Since 1998, this repellent has been employed on a global scale. When compared to DEET, picaridin is almost odourless, doesn't irritate the skin, and doesn't harm plastics.

#### 4. For Clothing: Permethrin

Permethrin works well as a repellent and a pesticide. It is meant for usage in garments, not on the skin. Contrary to DEET, Permethrin can maintain its effectiveness despite multiple launderings for at least two weeks.

#### Material Required for Mosquito Repellent<sup>17</sup>:

1. Kerosene oil
2. Potash alum
3. Lemon grass oil



**Fig. 2 Potash Alum**



**Fig. 3 Kerosine oil**



**Fig.4 Lemongrass oil**

#### Extraction of lemon grass oil by steam distillation method<sup>18</sup>:

1. 150 gm of fresh lemon grass sample was placed into the 1-litre round bottom flask containing 250 ml of distilled water.
2. The beaker was heated and equipped with a rubber stopper connected to the condenser.

3. The condenser circulated water at zero degrees Celsius to condense the ensuing vapour.
4. Lemongrass essential oil is released when the water temperature exceeds 100°C.
5. When the lemongrass got warmed up the lemongrass vital oil that was extracted from the leaf was mixed into the water vapours.
6. The vapour was concentrated into a liquid as both went through the condenser.
7. It was feasible to prepare to cool and prevent essential oil volatilization by using an ice block.
8. A 500ml beaker was used to publicly collect the condensate, which was then stream into a separating funnel.
9. This produced two layers of water and oil.
10. The separating funnel's top was unlock to allow the water to pass via, and the oil was then quickly collected into a 100ml stoppered bottle.
11. To stop the essential oil from vaporizing, the bottle was tightly secured.
12. The lemongrass oil was collected or the volume of oil obtained was consider.

### **FORMULATION<sup>19</sup>:**

1. Take 250ml of kerosine oil.
2. Add 25gm potash alum.
3. Cover and leave it for 7 days.
4. Take 50ml of paraffin oil.
5. Add 50 drops of lemongrass oil.
6. Mix them properly.

### **CONCLUSION:**

Plants have been used as an alternative source of repellent substances for centuries and are safer for human use than manufactured chemicals. Although there has been a lot of interest in creating plant-based pesticides as an option for chemical insecticides, little is known about these plants from a scientific standpoint. Due to the reality that mosquito-borne illnesses are impacting a significant portion of the global population, new essential oil-based mosquito-repellent devices have a wider application. One way to make them long-acting is to incorporate essential oils into polymeric delayed-release devices, and a multiple emulsion with an essential oil centre might be a clever delivery method.

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**REFERENCES:**

1. J. Nat. Prod (2012). Plant Resource, scholars research library, Page no. 322-327.
2. Taubes G. August 24, (1997). Mosquito bites Back New York Times Magazine, Page no. 40-60.
3. Shell E.R, August (1997). The resurgence of a deadly disease, Atlantic Monthly, Page no. 45-60.
4. World Health Organization (1999), Malaria, Geneva, Page no. 94.
5. Lamberg, S.I. & Mukrennen, J.A, (1969). Bullous Reaction to Diethyl Toluamide, Archives of Dermatology, Page no. 582-586.
6. Peterson, C. J. (2001). Insect repellents of natural origin: Catnip or dosage orange. PhD. Dissertation, Iowa State University, Ames, IA. Page no. 70-77.
7. Sneha Agarwal. Formulation of Natural Mosquito Repellent, International journal of advance research, ideas and innovations in technology (Volume 4, Issue 1)Page no. 34-39.
8. Narayan prasad Yadav, (2014). A Novel Approach for Development and Characterization of Effective Mosquito Repellent Cream Formulation Containing Citronella Oil, Biomed research international, Page no. 34-37.
9. V.nandani, (2017). Formulation of novel herbal cream as a mosquito repellent, International journal of pharmaceutical research, Page no. 133-135.
10. Ranasinghe MSN, (2016). Development of Herbal Mosquito Repellent Formulations, International Journal of Collaborative Research on Internal Medicine & Public Health, Vol. 8, Page no. 6.
11. Mark s.fradin (2002) .Comparative Efficacy of Insect Repellents against Mosquito Bites, N Engl J Med, Volume 347, Page no. 13-18.
12. Mi Young Lee (2018). Essential Oils as Repellents, Biomed res int, Page no. 565-595.
13. Pronobesh Chattopadhyaya, July (2015), Essential oil-based polymeric patch development and evaluating its repellent activity against mosquitoes, Acta Tropica, Volume 147, Page no. 45-53.
14. Bruno Fonseca-Santos, February, (2019), An effective mosquito-repellent topical product from liquid crystal-based tea tree oil, Industrial crop production, Volume 128 Page no. 488-495.
15. S.S.Chenga, May (2013), Larvicidal activities of wood and leaf essential oils and ethanolic extracts from Cunninghamia Konishi Hayata against the dengue mosquitoes, Industrial crop production, Volume 47, Page no. 310-315.

16. Jayapal Subramaniama, 4, October (2012), Mosquito larvicidal activity of *Aloe vera* (Family: Liliaceae) leaf extract and *Bacillus sphaericus*, against Chikungunya vector, *Aedes aegypti*, Saudi Journal of Biological Sciences Volume19, Page no. 503-509.
17. Roman Pavela, 15 December (2015), Essential oils for the development of eco-friendly mosquito larvicides. , Industrial crop production, Volume 76, Page no. 174-187.
18. Virendra K Dua, 8 June (2009), Larvicidal activity of neem oil (*Azadirachta indica*) formulation against mosquitoes, Malaria journal, page no.1475-2875.
19. Bhupen Kalita, (2013), Plant essential oil as a mosquito repellent, International Journal of Research and Development in Pharmacy & Life Sciences 3, Page no. 715-721.

