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Mosquito Repellent Cream Using Polyherbs Against Malaria Parasites

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ABSTRACT:

Mosquito repellent cream is intended to product against from mosquito bites. Particularly from Anopheles mosquitoes which spread malaria. A natural blend of Marigold (*Tagetes erecta* L.), Mint (*Mentha piperita*), and Citronella (*Cymbopogon nardus* L.) essential oils. This herbal combination provides long-lasting protection against mosquito bites. Marigold extract contains bioactive compounds known for their mosquito-repelling properties, while mint oil offers a cooling and refreshing sensation. Citronella oil contributes to both the fragrance and repellent effectiveness of the cream. Sensitive skin can safely use this polyherbal cream since it is an environmentally friendly and chemical-free substitute for synthetic repellents. Due to its natural composition the cream is safe, non-greasy, and rapidly absorbed into the skin. It provides a gentle, non-irritating, and skin-friendly way to avoid mosquito bites and reducing the risk of mosquito-borne diseases such as malaria, dengue, and chikungunya.

KEY WORDS: Mosquito Repellent Cream - Using Poly Herbs – Marigold, Mint, Citronella, Against Mosquito Borne Disease.

INTRODUCTION:

Herbal formulations are prepared by extracting active constituents from the biological sources of herbal plants, herbal preparations are belief to be more potent as well as have very less side effect in compare to any other synthetic chemical preparations and it makes the reason for increase in demands for herbal preparation around the world (Sanjt *et al*, 2021).

Marigolds (tagetes species) are one of the most significant and widely cultivated commercial flower crops on the world. (Singh *et al 2016).* Marigold is becoming a more important commercial source of carotinoid pigments. The primary pigment in the flowers is xanthophyll, of which lutien accounts for 80 to 90% in the form of plamitic and myristic acid esters *(*Alam *et al.,* 1968).

Mosquitoes are a serious threat to public healthtran smitting sever dangerous diseases for over two million people in the tropics. There has been a large increase in the insecticide resistance of this vector and has become a global problem. Insecticide's residues in the environment, as a result of chemical insecticide usage, have turned the researcher's attention towards natural products. In the past years, the

plant kingdom has been of great interest as a potential source of insecticidal products. Many species in the plant kingdom synthesize a variety of secondary metabolites which play a vital role in defense of plants against insects/mosquito (Shivaji *et al, 2024).*

With over many species of mosquitoes believed to be responsible for spreading diseases such as yellow fever, dengue hemorrhagic fever, epidemic polyarthritis, encephalitis and malaria. According to the World Health Organization (WHO) such diseases cause more than 3 million deaths annually. There are many treatments for Malaria and other mosquito transmitted diseases but it is always better to prevent the disease (Bhide *et al,* 2014).

INSECTICIDAL ACTIVITY:

The ability of a substance to kill, repel, or control a wide range of insect pests by affecting their survival, feeding, or reproduction.

MOSQUITOCIDAL ACTIVITY:

A specific type of insecticidal activity that targets mosquitoes, either by killing their larvae, pupae, or adults, or by repelling them to reduce mosquito-borne disease transmission.

MALARIA - TRANSMITTING MOSQUITOES:

Mosquito vector (Genus: *Anopheles*)	**Causative agent**	**Distribution**
Anopheles gambiae Complex	*Plasmodium falciparum (Highest risk)*	Sub-saharan africa
Anopheles funestus	*P. Falciparum, P. vivax (Highest risk)*	Sub-saharan africa
Anopheles stephensi	*P. Falciparum, P. vivax* (Highest risk)	South asia, middle east (Urban malaria rising)
Anopheles culicifacies	*P. Falciparum, P. vivax*	India, southeast asia
Anapheles minimus. An dirus	*P. falciparum.P. vivax*	Southeast asia
Anopheles albimanus	*P. Falciparum, P. vivax*	Central america, caribbean
Anopheles maculatus	*P. Falciparum, P. vivax*	Southeast asia
Anopheles freeborni,	*P. Falciparum, P. Vivax*	North america

An. quadrimaculatus	(historically)	(Now eliminated)

LIFE CYCLE OF MOSQUITO:

THE LIFE CYCLE OF A MOSQUITO CONSISTS OF FOUR STAGES:

Mosquitoes have four distinct stages during their life cycle: Eggs, Larva, pupa and Adult. The adult stage is free-flying and the other stages are aquatic. The length of time that a mosquito takes to complete its life cycle varies according to food availability. During weather conditions some mosquitos can complete their entire life cycle in only 8 to 10 days.

EGG:

Egg close to water's surface, female mosquitoes deposit their eggs. Either group egg laying is possible. Depending on the surroundings, it may take a few days or several weeks for the eggs to hatch because they need water.

LARVA:

Larva also Known as "wigglers" after they hatch, the larvae are aquatic organisms. They experience four growth phases, or "instars." Bacteria and algae are among the organic elements that larvae eat from the water. Through a syphon at the water's surface, they breathe air.

PUPA:

Following the larval stage, mosquitoes transition into the pupal stage, which they refer to as "tumblers" due to their tendency to move in the water. The mosquito changes into its adult form during this phase, which is devoid of eating. Depending on the species and climate, the pupal stage might last anywhere from a few days to a week.

ADULT:

After emerging from the pupal case, the adult mosquito lays its wings and body on the water's surface before taking off. Depending on the species and the habitat, adult mosquitoes normally have a lifespan of a few weeks to a few months. While male mosquitoes often feed on nectar and other plant liquids, female mosquitoes prefer blood meals in order to grow their eggs.

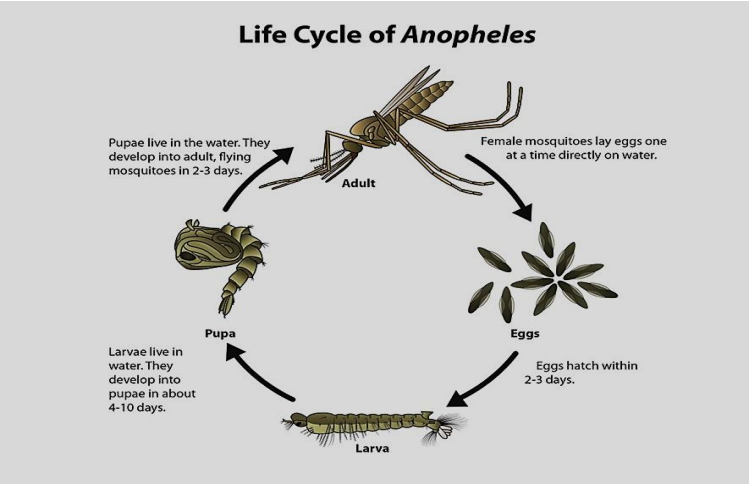

Figure1: Life cycle of Anapheles mosquito

MOSQUITO BORNE DISEASES

Diseases that human's contract from mosquito bites are known as mosquito-borne diseases. The following are a few of the most important:

1) Malaria:

Largely spread by *Anopheles* mosquitoes, it is caused by *Plasmodium* parasites. Flu-like symptoms include chills, fever, and body aches.

2) Dengue:

Virus *Aedes aegypti* mosquitoes are the primary vectors of dengue fever, which is caused by the dengue virus. Severe headache, joint/muscle discomfort, eye pain, and high temperature are among the signs and symptoms.

3) Zika Virus:

This virus, which is also carried by Aedes mosquitoes, is usually asymptomatic but can cause severe birth defects if contracted during pregnancy.

4) West Nile:

Virus *Culex* mosquitoes are the primary vectors of the West Nile virus. The majority of infections are mild, but severe ones have the potential to lead to neurological conditions.

5) Chikungunya:

Caused by fever and excruciating joint agony, this disease is spread by *Aedes* mosquitoes.

6) Yellow fever:

Spread by *Aedes* and Haemagogus mosquitos, the yellow fever virus can cause severe liver damage and haemorrhage.

7) Japanese encephalitis:

A viral disease that can inflame the brain that is transmitted by *Culex* mosquitoes. Using insect repellent, donning protective clothes, and removing standing water a breeding ground for mosquitoes are examples of preventative actions. Certain diseases, like Japanese encephalitis and yellow fever, have vaccines available

PROPERTIES OF ESSENTIAL OILS AND ITS USES:

1.MARIGOLD:

Marigold Extract

- Scientific Name: *Tagetes erecta*
- Synonym: Aztec Marigold, Mexican Marigold.
- family: Asteraceae

Chemical Constituent:

Beta-carotene, lycopene, zeaxanthin, neoxanthin, phytoene, phytofluene, violaxanthin and alpha cryptoxanthin.

USES:

The researchers intend to use marigold plant (*Tagetes erecta)* parts as suitable components of the mosquito repelleing property. It does not contain harmful chemical which are present in some commercial products it repels mosquitoes without destroying the environment. It contains a particular smell that many insects findup appetizing. The smell is caused by a chemical known as "a-terthienyl". Which lends a natural insecticidal property in marigold. Other toxic compounds available in all the ingredients are alkaloid, papain, terpenes and cyanogenic glycosides that are objectionable to human health.

S. N 0	CATEGORY	SOURCE/ CONSTITUENTS	ACTIVITY	USES	REFERENCE
1.	**Chemical Constituents**	Quercetagetin (Flavonoid glucoside)	Antioxidant, derivative of quercitin	Antioxidant supplement, anti-inflammatory formation	Ghani *et al.*,1998
		Thienyl & ethyl gallate	Antioxidant, Antimicrobial compound	Natural preservative, antimicrobial agent, phytomedicine	
		Luetin (Xanthophyll, carotenoids)	Major pigments, strong antioxidant	Food colouring, nutraceticals	
2.	**INSECTICIDAL ACTTIVITY**	**ESSENTIAL OIL** a) Fresh & dried plants	Larvicidal effect on *Anopheles stephensi* [LC50~1 mg/L]	Natural biopesticide for malarial vectorr control	De Feo *et al.*,2005
		b) Aerial parts	Cytotoxicity against *Artemia salina* [ED50=3.16 mg/L]	Screeninng bioactive compoundss for insecticidal	De Feo *et al.*,2005
		Methanolic & dichloromethene extract	Insecticidal activity against *Sitophilus oryzae* [rice weevii]	Botanical grain /storage pest management	Broussalis *et al.*, 1999

3.	**MOSQUITIOCIDAL ACTIVITY**	Flower extract (ethanol, chloroform petroleum ether)	Toxic against *culex quinquefaciatus* Larvae [LC50=1.706-75 g/ml, stage-dependent]	Natural larviccidal for mosquito control. [Filariasis vector]	Rahman et al.,2009
		Leaf essential oil	Effective against *Aedes aegypti, culex quinquefaciatus* less. Potent than prallenthrin	Eco-friendly botanical alternative in dengue, Chikungunya &Filariasis vector control.	Satoto et al.,2008

2.CINTRONELLA OIL:

It is reputed to reduce muscles spasms, ease headaches, and boost energy. Used cosmetically or topically in general, Citronella Essential Oil can deodorize and refresh foul body odors, eliminate head and body lice, slow the look of aging, enhance skin health, and improve skin's absorption of moisture. Oil of citronella is a naturally occurring insect and animal repellent distilled from two grass varieties. It is yellow to brown and has a grassy/floral smell. It is used as an insect repellent (Aankankasha wany, 2013).

- As an antifungal agent.
- To treat parasitic infections.
- To promote wound healing.
- To lift mood or fight fatigue.
- In perfumes or as a flavor additive in food.

3.MINT:

Scientific Name: *Mentha piperita*

Family: Lamiaceae

Chemical Constituents:

- Volatile oils (menthol, menthone, limonene)
- Flavonoids (luteolin, apigenin)
- Phenolic acids (rosmarinic acid)

Insect Repellent – Natural mosquito and pest repellent due to menthol and essential oils.

4. LAVENDER OIL

Biological source: *Lavendula latifolia*

Family: Mint

Lavender essential oil is known to be rich in medicinal properties like antimicrobial activity, anxiolytic, anti-inflammatory, antinociceptive, and antioxidant properties. Utilization of herbal products like lavender essential oils will benefit the patients in many ways. Lavender is probably the No 1 essential oil when it comes to healing skin conditions, burns and cuts. With its anti-inflammatory, antifungal, antimicrobial and detoxifying benefits, lavender essential oil can help reduce redness, soothe and calm the skin and rapidly heal minor cuts and scrapes, as well as any rashes (S Kajjari, 2022).

6.SHEA BUTTER:

Family: Sapotaceae

Scientific Name: *Vitellaria paradoxa*

- It helps improve the cream texture, making it easy to apply.
- Its anti-inflammatory property soothes skin if bitten by mosquitoes.
- Works as a carrier and stabilizer for repellent oils, prolonging their effect

MALARIAL MOSQUITOES:

The natural history of malaria involves cyclical infection of human and female *Anopheles* mosquitoes.

MALARIAL INFECTION:

Malaria is an infectious diseases caused by a parasite, *Plasmodium*, which infects red blood cells. It has infected humans since the beginning of mankind. Four common species that cause malaria: *Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae, Plasmodium ovale*. Most serious type is *Plasmodium falciparum* malariae. It can be life threatening. The other three common specious of malaria are generally less serious and are usually not life-threatening.

MALARIAL COMPLICATIONS:

- Cerebral malaria
- Blackwater fever
- Pulmonary edema
- Very low blood of sugar
- Hemolysis
- Coagulopathy

MALARIAL SYMPTOMS:

The time between the infective mosquito bite and the development of malaria symptoms can range 12 to 30 days depending on the type of *Plasmodium* involved. One strain of *Plasmodium* called *P. vivax*, may have a prolonged incubation period depends on the number of parasites transferred but is usually less than two months.

MALARIAL TREATMENT:

Malarial treatment is based on the infecting species of *Plasmodium* parasite and the clinical situation of the patient as well as the drug susceptibility of the infecting parasites. Mild malaria requires treatment based on oral medication. Severe malaria requires intravenous drug treatment and fluids in the hospital. And there are three ways to prevent malarial infection.

Control mosquitoes: To conduct a good vector control.

Keep mosquitoes from biting: wear long pants and shirts with long sleeves. Apply mosquito repellent cream and use mosquito net.

Take mosquito to keep getting sick after a bite: Reduces the way of contract malaria, but it does not always work.

CONCLUSION:

The formulation of mosquito repellent cream using polyherbal combinations such as Mint, Marigold and Citronella offers a safe and eco-friendly alternative to chemical repelent. These herbs contain bioactive compounds that have been shown to have insecticidal, larvicidal, and repellent properties. It highlights the potential of traditional knowledge and herbal resources in addressing modern public health challenges. Combining these herbal ingredients in a cream base not only enhances the repellent activity but also ensures additional skin benefits, such as hydration, soothing, and protection from irritation. poly-herbal formulations are safe, biodegradable, and suitable for prolonged use without causing harmful side effects. Moreover, such creams are cost-effective, easily formulated, and can be produced sustainably, supporting both health and environmental well-being.

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