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## Review Article

# A Review On : Development And Evaluation Of Efficacy Of Herbal Mosquito Repellant Fast Card

Meghana Rayjade, Priyanka D. Gaikwad\*, Apeksha N. Chavhat, Pratik P. Wani

Matoshri Institute of Pharmacy Dhanore Yeola, Nashik Maharashtra.

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### ABSTRACT

It has been discovered that plants are rich in both food and medicine. Humans have been looking for novel plant secondary metabolites, or phytochemicals. The leftover plant material is thrown away after the flowers have been harvested. It is well known that *Tagetes erecta* has insecticidal properties. The leaf, stem, and flower were the three parts used to test the insecticidal property. In order to evaluate the mosquito repellent activity, the powdered material was burned after being used to make fast cards. Comparing the leaf powder (25%) with a commercial product has yielded encouraging results. It was discovered to have no negative effects. Comparing the production cost to a commercial product, it is significantly lower (75%).

### INTRODUCTION

Numerous mosquito species are thought to be the source of diseases like malaria, encephalitis, yellow fever, dengue hemorrhagic fever, and epidemic polyarthritis.[1,4]The World Health Organisation (WHO) estimates that these illnesses result in more than 3 million fatalities each year.[2] Malaria and other diseases spread by mosquitoes have numerous treatments available, but it is always preferable to avoid the illness. Thus, the phrase "mosquito and other repellent" was created. Applying repellent topically or in other ways keeps mosquitoes from biting. Both natural and synthetic repellents can be made.

Natural coils for mosquitoes: Unfortunately, the majority of man-made chemical repellents, particularly DEET, are easily absorbed through the skin and can result in numerous unintentional poisonings, particularly in young children. They have the ability to poison wildlife as well. DEET- N,N-Diethyl-meta-toluamide is extremely harmful to the environment, and DDT- Dichlorodiphenyltrichloroethane is thought to be a teratogen, mutagen, or carcinogen. Thus, the need arises for an additional method of insect repelling that is preferably non-toxic. Insect and mosquito repellents are known to be found in many natural substances[3]. The majority of tropical and

\*Corresponding Author: Priyanka D. Gaikwad

Address: Matoshri Institute of Pharmacy Dhanore Yeola, Nashik Maharashtra.

Email ✉: [priyankagaikwad1601@gmail.com](mailto:priyankagaikwad1601@gmail.com)

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subtropical diseases that have catastrophic effects on humans are spread by mosquitoes[5]. Malaria, yellow fever, filariasis, schistosomiasis, Japanese encephalitis (JE), and the worst, dengue hemorrhagic fever, which is brought on by *Aedes aegypti*, are the most frequent and terrifying illnesses linked to mosquitoes[6–7]. The pantropical pest and urban vector of *Wuchereria bancrofti*, *Culex quinquefasciatus*, is the carrier of filariasis[8]. Because *Aedes aegypti* and *Culex quinquefasciatus* are vectors of dengue and filarial fever, respectively, which are major public health issues in nations like India, attention has been drawn to controlling these insects. Consequently, research is being done to find novel plant entities that can stop the spread of diseases carried by mosquitoes and safeguard control of mosquitoes in the environment from the use of chemical pesticides. Numerous plants exhibit antirepellent properties, which are necessary for disease prevention. Because they are plant-based, they are generally safe and do not have any negative effects. Essential oils from one or more of the following plants are present in a large number of plant-based mosquito repellents currently available on the market: citronella, cedar, eucalyptus, geranium, lemon-grass, peppermint, neem, soybean, and marigold [9]. They are a powerful source of repellent action as a result. They provide mosquito protection in this way, all without causing any negative side effects. Natural mosquito coils are a practical and effective, but synthetic coils can be hazardous due to their adverse effects.



**Fig no.1 Tagetes erecta.**

#### **Taxonomical classification [10]**

Kingdom :Plantae

Order: Asterales

Family: Asteraceae

Genus :Tagetes

Species :Tagetes erecta

#### **Chemical composition**

Parts of the marigold plant (*Tagetes erecta*) will be used by the researchers to make a mosquito-repellent fast card. It repels mosquitoes without harming the environment and doesn't contain any harmful chemicals like some commercial products. It has a distinct scent that attracts a lot of insects. "A-terthienyl" is the chemical responsible for the odour. which gives marigold a built-in insecticidal quality. All of the ingredients contain additional harmful substances that are bad for human health, such as cyanogenic glycosides, papain, alkaloids, and terpenes. Moreover, it has pyrethrin, a naturally occurring substance that kills mosquitoes. Marigold is said to repel nematodes and a few common insect pests. For this reason, marigolds are frequently planted alongside potatoes, tomatoes, and chiles. Marigolds should not be planted close to any legume crops because of the antibacterial thiophenes that are released by the roots. Aphids, white flies, maggots, and numerous other pests are repelled by thiophenes. It is thought that the volatiles extracted from the *erecta* species' flower through simultaneous steam distillation extractions (SSDE) have stronger

insecticidal activity. Pyrethrin, an ingredient in many insect repellents, is present in flowers.

## MECHANISM OF ACTION OF MOSQUITOREPELLENTS

For female mosquitoes, carbon dioxide, excretory products, and lactic acid found in perspiration from warm-blooded animals are attractive substances. The Chemoreceptors in mosquito antennae are responsible for the detection of odours. The repellents prevent upwind flight by blocking lactic acid receptors, which causes the mosquitoes to lose contact with their host [14,15]. Typically, insect repellents function by disguising the smell of humans or by employing a scent that insects instinctively avoid. The difference with permethrin is that it's a contact drug.

### Methodology

1. From Ayurvedic Samhitas, herbal remedies with Vishaghna and Krumighna qualities were chosen.
2. The R.S.M. department at Dravyaguna conducted the authentication of the aforementioned herbal medications.
3. The herbs were gathered and organised.
4. An insecticidal extract from marigold flowers was made.
5. All component extracts were combined, and a solution with the consistency of a thin liquid paste was prepared.
6. The prepared solution is applied to pieces of clothing and various papers with varying textures and thicknesses.

Here are some methods for applying the solution:

- a. Using a paintbrush to apply the mixture
  - b. Misting the blend onto handmade paper.
  - c. dipping cloth or paper in the mixture
7. The solution was tested for burning, efficacy, and cost-effectiveness after being applied to the paper and cloth at different times
  8. Lastly, using the solution on 400 GSM handmade paper in the colour creamy white turned out to be very advantageous.

9. The paper was left to dry overnight.
10. After applying the prepared solution one, three, five, and seven times, it was burned to test its effectiveness.
11. When the solution was applied six times to both sides and bhutrun oil was added during the seventh application, the most effective result was produced.
12. The strip was divided into equal-sized cards that were 5 cm by 7 cm.
13. A total of thirty locations (with an area of 100–150 square feet) were used to test the mosquito repellent Fast Card. It was a closed area. The windows were shut.

### Catnip Repels Mosquitoes More Effectively Than DEET

According to researchers, nepetalactone, the catnip plant's essential oil that gives it its distinctive scent, is roughly ten times more effective at keeping mosquitoes away than DEET, the ingredient in the majority of commercial insect repellents.[16].

Security precautions to be taken when applying insect repellent on children and expectant mothers[17].

- Because they may be exposed to repellents more frequently, children may be more susceptible to negative reactions.
- Keep repellents out of children's reach.
- Use minimal amounts of repellent on children; do not let them apply repellents to themselves.
- Repellents should not be applied to young children's hands as this could lead to unintentional eye contact or ingestion.

When possible, dress kids in long sleeves and long pants tucked into boots or socks to help minimise the need for repellents feasible. Cover strollers, playpens, etc. with netting. Pregnant women should take care to avoid exposure to repellents when at all possible, as the foetus may be vulnerable to chemical exposures in general.

### Alternatives to mosquito repellent



- An alternative is to use incense coils, which you can burn.
- They release a cloud of smoke containing pesticides.
- Mosquito coils with an allethrin-containing form; DEET-infused wrist bands; and mosquito repellent vapour.

### Evaluation test

#### A. Repellency test:

This test is carried out in a cuboidal glass box with an opening that allows mosquitoes to pass through. The six mosquitoes were placed inside the box, which was designed to resemble a room in a house. The coil inside the box was burned. It was noted how long it took the mosquitoes to attempt to flee, find a number, or end their lives.

#### B. Test for smoke toxicity:

In a chamber, a smoke toxicity experiment was carried out. After ten adult mosquitoes were released into the chamber, they were subjected to 45 minutes of incense smoke exposure. Every 15 minutes, the mosquito mortality data were recorded. The above-tested commercial citronella incense stick was used to compare the smoke toxicity[11].

#### C. Assessing the effectiveness of mosquito repellent

To conduct the test, just the mosquito-prone areas during the evening and night were chosen. The public comments were accepted and then recorded. The prepared incense sticks were examined for any negative effects, such as irritation, coughing, or tears, and records were made in order to investigate the mosquito repellent activity. The amount of ash the stick produced was measured and noted[11].

#### D. Activity larvicidal:

##### a. Making plant extracts:

The powdered leaf was prepared and then soaked in ethyl acetate, petroleum ether, water, and chloroform (plant material to solvent ratio:1:10, w/v). The extract was then left to extract for 24

hours at room temperature, shaking at 150 rpm. After filtering, the extract was dried at 40°C. Re-suspended were the dried extracts in 1 millilitre of acetone.

#### b. Biological Assay:

Distilled water was used to prepare various extract concentrations. Every experimental exposure was carried out in a petri dish. Using a Pasteur pipette, twenty-five (25) larvae were collected and put in petri plates with different concentrations of crude extracts. A control test was conducted using only distilled water. To prevent the entry of any foreign material, muslin cloth was placed over the petri plates. After 24 hours of exposure to the test solution, the observed mortality was noted. Any mortality from this data was examined, and the percentage of mortality was noted[12].

$$\text{Percentage of mortality} = \frac{1 - \text{Population in treated plot after treatment}}{\text{Population in control plot after treatment}} \times 100\%$$

An old method of extracting volatile oils is water distillation. Because of its simplicity, it is used all over the world, although heating and cooling it requires a lot of energy. A 100 ml volume of distilled water was added to a round-bottom flask containing the 15 g of powdered material leaf. Boiling of the mixture was permitted. When the water boiled long enough, steam was produced. The condenser is where the essential oil from the leaf materials is collected instantaneously. After cooling, the essential oil and water were collected.

#### Pharmacological activity

##### Mosquitocidal activity

Research has been done on the mosquitocidal effects of *Tagetes erecta* flower ethanolic extract and its petroleum ether and chloroform soluble fractions on *Culex quinquefasciatus* larvae. Using the WHO standard procedure, the larvicidal effect of ethanol extract and its solvent fractions was assessed against various *C. Quinquefasciatus* instars [18].

##### Anti-fungal activity



At a concentration of 2000 ppm, the damping-off pathogen *Pythium aphanidermatum* was completely inhibited in its growth by the fungitoxic activity of *Tagetes erecta* leaves essential oil [19].

#### **Antibacterial activity**

*Tagetes erecta* flower solvents have been tested for their ability to inhibit the growth of various bacteria, including *Streptococcus mutans*, *Proteus vulgaris*, *Campylobacter coli*, *Escherichia coli*, *Klebsiella pneumoniae*, and *Bacillus cereus*. The flavonoid exhibits a maximal zone of inhibition for *Klebsiella pneumoniae* (29.50 mm) and antibacterial activity against all tested strains. One of the possible components of its antibacterial action is flavonoid-patulitrin [20]. Maximum inhibitory action against *Neisseria gonorrhoea* strain was demonstrated by the flower parts [21].

#### **Hepatoprotective activity**

When compared to the CCl<sub>4</sub>-intoxicated group, the ethyl acetate fraction of *T. erecta*, at an oral dose of 400 mg/kg, significantly decreased the elevated serum levels of ALT, AST, ALP, and bilirubin, bringing them almost to normal. Rats given 400 mg/kg of the extract and CCl<sub>4</sub> showed notable improvements in their liver histologically, with the exception of foci of lobular inflammation, mild inflammation, and cytoplasmic vascular degenerations surrounding portal tracts [22].

#### **Anti-cancer activity**

Marigold has been used traditionally for many therapeutic purposes as a medicinal herb. Researchers looked into the cytotoxic potential of marigold flower extracts in ethanol and ethyl acetate, as well as how they affected the enzymes tyrosinase and elastase. The cytotoxicity of these two extracts was assessed using an assay on the colon cancer cell line CaCO<sub>2</sub> and the lung cancer cell line H460 [23].

#### **Traditional uses**

Traditional medicine uses several parts of the *Tagetes erecta* plant, including the flower, to treat

a variety of illnesses. This plant's leaves are used as an antiseptic, for boils and carbuncles, as well as for kidney problems, muscle soreness, and piles. The flower petals are used in Ayurvedic medicine to treat fevers, epileptic fits, stomachic complaints, scabies, liver complaints, astringent, carminative, and eye diseases. They are believed to cleanse the blood, and flower juice is used to treat rheumatism, colds, bronchitis, and bleeding piles [24]. It has been discovered that several *Tagetes* species have analgesic, wound-healing, hepatoprotective, antimicrobial, and insecticidal properties [25]. The concentration of various secondary metabolites and the most significant compounds in *Tagetes erecta* are associated with its pharmacological activity [19].

#### **Observations**

30 distinct locations' observations were recorded, and sample feedback was obtained, which shows. All thirty of us appreciated the card's size. All thirty of them thought the card's colour was beautiful. The card was easily agitated. Every card ignited in two to three seconds with ease. Card size at burning time was 5 cm by 7 cm. It takes five to six minutes to burn completely. Five to eight percent of the paper doesn't burn. All thirty of them enjoyed the pleasant smell that lingered after burning. All thirty people reported a mosquito-repelling effect. There was no negative impact on symptoms that was noticed. Even after ventilation, or penetrating windows, the effect of repelling mosquitoes lasted for one to two hours.

#### **CONCLUSION**

The Fast Card, made with the aforementioned medications, turned out to be an effective, safer, more affordable, and superior mosquito repellent. The prepared fast card mosquito repellent is environmentally friendly. It is relatively safe, fast acting, portable, and has a long-lasting effect.

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