



## **Comparitive Study of Formulated Herbal Mosquito Repellent Incense Sticks with Market Product**

**S. Valarmathi <sup>a\*</sup>, M. Senthil Kumar <sup>a</sup>, Chithra <sup>a</sup>, Coralinanisha <sup>a</sup>,  
Antony nelson Prabhu <sup>a</sup>, Aloysius Shibin <sup>a</sup> and Abzal <sup>a</sup>**

<sup>a</sup> *Annaiveialnkanni Pharmacy College, India.*

### **Author's contribution**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

The mosquito repellent formulations that are available on the market are causing irritations like coughing, sneezing, allergic reactions and respiratory disorders to human. The mosquito repellents available in the market are in various forms like coils, mats, sprays and fast cards. So the present study was carried out to formulate mosquito repellent incense sticks using herbals like Vitex negundo, Neem, Holy basil, and Garlic. The poly herbal mosquito repellent formulation are made by hand rolling method. The solid formulation containing binders and additives are rolled in the form of incense sticks and dried for 24 hrs. After drying its evaluated and compared with the market formulation. The prepared herbal mosquito incense sticks are potent, safe with more duration of time and less cost.

**Keywords:** *Mosquito repellents; essential oil; herbals.*

### **1. INTRODUCTION**

The word mosquito is called as little fly. The body of the mosquitoes are slender, segmented, one pair of wings, three pairs of long hair like legs and long mouth parts.

The mosquito crosses several stages in its life cycle like egg, larva, pupa and adult stages. The matured female mosquitoes have tube like mouth part that will pierce the skin of a human and withdraw the blood to produce the eggs and the

\*Corresponding author: E-mail: sahanashree2012@gmail.com;

mosquito also needed proteins and iron for the egg production<sup>1,2</sup>.

After the bite of the mosquito the itchy feel is due to the saliva of the mosquito. Mosquito develops so many diseases in human like dengue, malaria, yellow fever etc.

Mosquito repellent are also called as “bug spray”. The mosquito repellents are applied to surface of skin to avoid mosquito biting on the skin. Mosquito repellent are used to prevent and control the diseases like malaria, dengue and fever. Use of synthetic repellent causes many health issues like respiratory problems so natural synthetic repellents like neem, garlic, basil, camphor, castor oil, cinnamon, clove oil, D-limonene, fennel oil, marigold. Synthetic insect repellents are DEET (N,N-diethyl-m-toluamide), dimethylcarbate, picaridin, metofluthrin, permethrin. Mosquito can be repelled by also using mosquito net, using clothes that covers total body<sup>3,4</sup>. By using fan with more air, using light coloured clothes can avoid the contact of mosquito. To control adult mosquitoes van mounted fogging machines and hand fogging machines are used<sup>5,6</sup>.

Some of the natural products with repellent activity are<sup>7,8</sup>

1. Achilea alpine
2. Alpha-terpinene
3. Camphor
4. Castor oil
5. Cedar oil
6. Cinnamon
7. Citronella oil
8. Clove oil
9. Garlic
10. Fennel oil
11. Lemon grass oil
12. Marigold
13. Neem oil
14. Peppermint
15. Rosemary

## 1.1 Recent Mosquito Repellents<sup>9,10</sup>

### 1.1.1 Electronic insect repellents

Electronic insect repellents devices that produce ultra sounds intended to keep away insects are marketed. These devices prevent human from being bitten by a mosquito.

### 1.1.2 Mosquito traps

A recent approach is the automatic lethal ovitrap, which works like a traditional ovitrap but

automates all steps needed to provide the breeding spots and to destroy the developing larvae.

In 2016 researchers designed low cost trap called ovillanta. Which consists of attractant – laced water in a section of discarded rubber tire. At regular intervals the water is run through a filter to remove any deposited eggs and larva.

## 2. MATERIALS AND METHODS

### 2.1 Ingredients

Table 1. Formulation table

S.No	Ingredients	Polyherbal formulation
1	NEEM	10 gm
2	VITEX NEGUNDO	10 gm
3	HOLY BASIL	10 gm
4	GARLIC	5 gm
5	BENZOIN	5 gm
6	CHARCOAL	50 gm
7	STARCH	10%
8	LEMON GRASS OIL	Q.S.
TOTAL		100 gm

### 2.2 Method of Preparation of Incense Sticks

- All the dried herbs were finely powdered in a mixer and then passed through a sieve(no.80). The powder shall be very fine to avoid problems in the stage of binding and burning. 100g of powder premix was taken to prepare 20 incense sticks.
- The quantity of plant material taken is listed in Table 1. Water was gradually added to the fine powder until it attained dough-like consistency. It should be well mixed and not too watery, otherwise it creates problems in making sticks.
- The dough was divided into portions and was rolled by hand in small quantities on plain bamboo sticks. This can be done by a machine in large scale production. The sticks were dried for 24hours under shade.
- Tray dryer can be used to dry the sticks faster. The dried incense sticks were scented with lemongrass oil. Finally sticks were packed in a suitable packing material preferably plastics

### 2.3 Evaluation

#### 2.3.1 Burning on users

Test was done by simply selecting mosquitoes from areas in the evening and night period. The

public remarks were noted down after allowing them to investigate mosquito repellent activity. The prepared incense sticks were checked for causal effects such as irritation, coughing, and tears were observed and recorded. The results are compared with the marketed formulation.

### 2.3.2 Smoke toxicity test <sup>11,12</sup>

Smoke toxicity test was conducted in a chamber measuring 34.5x24x0.95 cm. Then adult mosquitoes were released into the chamber and they were exposed to the smoke of burning incense sticks for 45 minutes. The mortality data were recorded after every 15 minutes. Total number of mosquitoes used was 50. The results are compared with the marketed formulation.

### 2.4 Feed Back from 20 Volunteers

The feed back of prepared mosquito repellent incense stick were taken from 20 people .The results are compared with the marketed formulation.

## 3. RESULTS AND DISCUSSION

### 3.1 Evaluation of Burning on Users

Smoke from the herbal mosquito repellent sticks produce no toxic effect to humans and also act as germicidal. Incense sticks prepared are cost effective and easily portable. The prepared incense sticks were given to the 10 houses, hostel and canteen for getting feedback about the product depending on the duration of time, illness, and allergic reactions. The results are compared with the marketed formulation (Table 2).

### 3.2 Smoke Toxicity Test

Observation is done regarding time taken to burn the stick, fragrance of sticks, and duration of repellent activity. It is very safe to use and is nontoxic in nature. This mosquito repellent sticks can be used regular in houses and laboratories (Table 3).

**Table 2. Behaviour of mosquitos repellent sticks on ignition**

S.No	Areas	Formulation containing poly herbs	Marketed formulations
1	Houses	Less irritation and mosquitoes repelled	Coughing, sneezing and mosquito repelled
2	Hostel	No irritation and allergic reaction. Mosquitoes repelled	Eyes burning and eyes burning
3	Canteen	No irritation and coughing. Mosquitoes repelled	Vomit and dizziness and mosquito repelled

**Table 3. Smoke toxicity test for the prepared formulations**

Time (Minutes)	Poly herbal formulation	Marketed formulation
15	10	9
30	8	8
45	7	8
Total number of mosquito killed(Duration of repellent activity)	25	25

**Table 4. Feedback from 20 people**

Parameters	Excellent	Good	Average	Poor
Product elegance	15	5	---	---
Mosquito repellency	17	3	---	---
Odor of the incense stick	14	6	---	---
Allergy	---	---	---	---
Product satisfaction rating of 1 to 5 score (Average)	4	---	---	---

### 3.3 Feedback from 20 People

The feedback of mosquito repellent incense stick were taken from 20 people and requested to evaluate the prepared formulation containing poly herbs (Table 4).

### 4. CONCLUSION

The mosquito repellent incense sticks prepared using herbals show excellent mosquito repellent action and also have no side effects. The fragrance produced by the formulated sticks are good than marketed formulation. The incense sticks were eco-friendly, cost effective and safe to use. It is easily portable and can be easily used by all the age groups. The herbal incense sticks give a pleasant smell and repel mosquitoes, so the herbals are highly recommended for the formulation of mosquito repellent incense sticks. The lemon grass oil used in the formulation gives pleasant odour during ignition. The marketed formulation shows some complications like irritation to the eyes, coughing, sneezing and respiratory disorders.

### CONSENT

It is not applicable.

### ETHICAL APPROVAL

It is not applicable.

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### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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