

Formulation and Evaluation of Mosquito Repellent Incense Sticks From Waste Herbal Material

Dr. Yelmate A.A.^{1,*}, Dr. Satpute K.L.², Ms. Dudhe dishani³, Ms. Rutuja deshmukh.⁴

^{*,1,2,3} Dayanand College of Pharmacy, Latur, Maharashtra, India.

ABSTRACT:

Currently the use of synthetic mosquito repellent chemicals has several issues related to environment and human health. This project was formulated and developed to have safer mosquito repellent free from carcinogenic chemicals and are significantly cheaper and simple to develop. Dried powdered herbs like neem, pyrethrum flower head, camphor, starch, neem leaves were used to make mosquito repellent formulation. The powdered blend was mixed with binders and additives like charcoal powder. The solid formulation was rolled in the form of incense sticks. Further to add value, it was later scented with essential oil like lemongrass oil and dried. The incense sticks when ignited releases vapours with a pleasant fragrance and herbs which repels the mosquitoes. The incense sticks were tested for its potency by burning near the mosquito net cage with sufficient mosquitoes. The sticks also distributed to random peoples for feedback and were deemed to be very effective in controlling the mosquitos.

KEYWORDS: Mosquito repellent, Incense sticks and Essential oils.

Introduction:

Mosquitoes are most disturbing blood sucking insects affects human beings. Several mosquito species belonging to genera Anopheles, Culex and Aedes are vectors for the pathogens of various diseases like Dengue fever, Malaria, Yellow fever, Japanese Encephalitis and several other infections. Mosquitoes alone transmit diseases to more than 700 million people and over one million deaths are reported annually. Therefore, the control of mosquitoes and mosquito borne diseases is an important public health concern in the society. As many mosquitos' repellent products available in the market but reported to have serious harmful, adverse effects on human beings so the objective of the present study is to develop effective plant-based mosquito repellent products with minimum side effects.

Dengue fever is a mosquito borne disease which is characterized by symptoms like fever, headache, joint and muscle pains etc. The causative organism is arbovirus but it is spread by

genus *Aedes* mosquitoes. Some of the infections in Dengue are Fever and Shock Syndrome which can threaten the patient's life and leads to shock. Over the past few years, there has been increase in the frequency of occurrence of Dengue Fever.

MATERIALS AND METHODS:

| Sr. No | Ingredients | F1 Formulation | F2 Formulation |
|--------|-------------------|----------------|----------------|
| 1 | Neem powder | 20 gm | 20 gm |
| 2 | Marigold powder | 20 gm | 20 gm |
| 3 | Peppermint oil | 4 ml | 4 ml |
| 4 | Clove oil | 4 ml | 4 ml |
| 5 | Charcoal | 12 gm | 12 gm |
| 6 | Sandalwood powder | 10 gm | 10 gm |
| 7 | Starch | 10 gm | 10 gm |
| 8 | Camphor | 12 gm | 12 gm |
| 9 | Rose oil | 4 ml | 4 ml |
| 10 | Eucalyptus oil | 2ml | 4ml |

Method of preparation: All the dried herbs were finely powdered in a mixer and then passed through a sieve (no.80). The powder should be very fine or else there will be problems in the binding and burning. Total 100g of powder premix taken to prepare 20 incense sticks. The quantity of plant material taken is listed in table 1 and table 2. 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 and stored.



Raw materials.

Incense Sticks.

Mixture of raw material.



Mosquito Repellent Formulated Incense Sticks.

EVALUATION 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 F1 and F2 were checked for causal effects such as irritation, coughing, and tears were observed and recorded.

SMOKE TOXICITY TEST: 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 15minutes. Total number of mosquitoes used was 25.

FEED BACK FROM 20 VOLUNTEERS: The feedback of mosquito repellent incense stick was taken from 20 people and requested to evaluate the formulation (F1 and F2) containing poly herbs.

RESULT AND DISCUSSION:

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 peoples from houses, hostel and canteen have replied that less irritation, no allergic reactions and coughing. The mosquitoes also repelled after burning of the incense sticks.

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, hotels, canteens and laboratories. The formulation F2 containing poly herb was found to have more mosquitoes repelled in short period than F1 formulation. Feedback from 20 people and from the smoke toxicity test it was concluded F2 will be the best formulation than F1 formulation as it produces the smoke for a long period and kill the mosquitoes. The feedback of mosquito repellent incense stick was taken from 20 people and requested to use and evaluate the formulation (F1 and F2) containing poly herbs.

CONCLUSION: The mosquito repellent incense sticks were prepared using herbals show excellent mosquito repellent action without no side effects. The incense sticks were ecofriendly, 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 of the sticks. The F2 formulation containing poly herbs shows more mosquito repellent action than F1 formulation which contains eucalyptus oil 2ml only.

References:

1. U. Sakulku, O. Nuchuchua, N. Uawongyart, S. Puttipipatkachorn, A. Soottitantawat, and U. Ruktanonchai, "Characterization and mosquito repellent activity of citronella oil nanoemulsion," *International Journal of Pharmaceutics*, vol. 372, no. 1-2, 2009, p. 105–111,
2. Y. G. Gillij, R. M. Gleiser, and J. A. Zygodlo, "Mosquito repellent activity of essential oils of aromatic plants growing in Argentina," *Bioresource Technology*, vol. 99, no. 7, 2008. p. 2507–2515.
3. "How products are made: mosquito repellent," 2013, <http://www.madehow.com/Volume3/Mosquito-Repellent.html>.
4. Neeraj Dhingra, PrabhatJha, Vinod Sharma P, Alan A Cohen, Raju Jotkar M, Peter Rodriguez S et al. Adult and child malaria mortality in India, *Lancet*. 2010;376(9754):1768-1774.
5. Trongtokit Y, Rongsriyam Y, Komalamisra N, Apiwathnasorn C. Comparative repellency of 38 essential oils against mosquito bites. *Phytother Res*. 2005; 19:303-309.
6. Singh N, Mishra AK, Saxena A. Use of neem cream as a mosquito repellent in tribal areas of central India. *Indian J Malariol*. 1996; 33:99- 102.
7. Sharma VP, Ansari MA, Razdan RK. Mosquito repellent action of neem (*Azadirachta indica*) oil. *J Am Mosq Control Assoc*. 1993; 9:359- 360.
8. Pandey DM., Rani N., Vidyarthi AS., Wany A. Study of Citronella leaf based herbal mosquito repellents using natural binders. *Curr Res Microb Biotechnol* 2013; 1: 98-103.

9. Scott RR., Tawatsin A., Techadamrongsin Y., Thavara U., Wratten SD. Behavioral responses of *Aedes aegypti*, *Aedes albopictus*, *Culex quinquefasciatus*, and *Anopheles minimus* against various synthetic and natural repellent compounds. *J Vector Ecology* 2001; 26: 76-82.
10. Snodgrass, R. (1959). *The anatomical life of the mosquito*. Washington: The Smithsonian Institution. 9. Klowden MJ. Blood, sex, and the mosquito. *Bioscience*. 1995 May 1; 45(5):326-31.
11. Fornadel CM, Norris LC, Glass GE, Norris DE. Analysis of *Anopheles arabiensis* blood feeding behavior in southern Zambia during the two years after introduction of insecticide-treated bed nets. *Am J Trop Med Hyg*. 2010;83(4):848–853.
12. Karunamoorthi K, Husen E. Knowledge and self-reported practice of the local inhabitants on traditional insect repellent plants in Western Hararghe Zone, Ethiopia. *J Ethnopharmacol*. 2012;141(1):212–219.
13. Yelmate AA, Thonte SS, Satpute KL. Trace Element Determination in Medicinal Plant Samples by ED-XRF Analysis. *Herbs and Spices-New Advances*. 2022 Dec 8.
14. Yelmate AA, Thonte SS. Antibacterial activity of some Indian medicinal plants against methicillin resistant *Staphylococcus aureus* (MRSA). *Journal of Pharmacognosy and Phytochemistry*. 2019; 8(5):376-80.
15. Yelmate AA, Satpute KL, Bhausahab J, Swapnil P. Antiacne activity of *Trigonella foenum graecum* Linn. Seed Extract. *Journal of Pharmacognosy and Phytochemistry*. 2019; 8(6):1488-92.
16. Yelmate AA, Thonte SS. Ethnobotanical survey of plants on hattibet (Deverjan) district Latur Maharashtra. *Journal of Pharmacognosy and Photochemistry*. 2018; 7(3):1345-8.
17. Yelmate AA, Satpute KL, Design, Development and evaluation of Polyherbal soap against bacterial skin infections.
18. A.A. Yelmate, P. Gundewar, R.S. Moon; Design Development and Evaluation of Anti-Inflammatory Nanogel For The Treatment of Psoriasis, *Biologically Active Natural Products from Asia and Africa: A Selection of Topics* (2021) 1: 57. <https://doi.org/10.2174/9789811489747121010008>.
19. Dr. Yelmate A.A , Dr. Satpute K.L , Ms. Polawar Rutuja , Mr. Kande Suyog , Mr. Homkar Atharv, Formulation and Evaluation of Poly Herbal Mosquito Repellent Jar Candle, *International Journal of All Research Education and Scientific Methods*, 10(7), 2022.