IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 1, 2023

Development and Evaluation of Polyherbal Mosquito Repellent Dhoop

Niranjan Babu Mudduluru[*1], Devi Avula[2]

[1,2]Department of Pharmacognosy, Seven Hills College of Pharmacy, Tirupati, A.P., India

Corresponding Author
Dr. M. Niranjan Babu
Professor,Department of Pharmacognosy, Seven Hills College of Pharmacy, Tirupati, A.P., India – 517561, Contact: 7702484513, Email: principal.cq@jntua.ac.in

Abstract

Background:

Mosquitoes, belonging to the family Culicidae, encompass 3,600 species and are vectors for diseases such as chikungunya, dengue fever, and malaria. Herbal dhoop, a natural product composed of mosquito-repellent plant parts, offers a non-toxic and eco-friendly alternative to chemical repellents. This study evaluated the effectiveness of essential oils and plant extracts at varying concentrations in handmade mosquito sticks, tested in mosquito-prone areas. The findings indicated that combinations of herbal plants, including camphor, rutidosperma, neem, tulsi, and lantana camara, demonstrated significant mosquito repellent properties without causing skin irritation, making them safe and eco-friendly.

Aim:

To reduce eye irritation and minimize carcinogenic effects through the use of a polyherbal mosquito repellent dhoop, devoid of harmful sticks.

Objectives:

To develop commercial repellent products containing plant-based ingredients, which are increasingly popular among consumers due to their perceived safety compared to synthetic repellents.

Method:

The solubility of the herbal ingredients in various solvents was assessed. Different formulations of dhoop with various fragrances were created and evaluated. The most effective formulation was selected based on its mosquito repellent activity.

Results:

The preformulation parameters of the powder form met specific criteria, and all evaluation tests for the dhoop were successfully completed, yielding satisfactory results.

Conclusion:

The study concluded that the formulated herbal dhoop is an effective, cost-efficient, and non-toxic alternative to currently available chemical-based mosquito repellents, promoting a mosquito-free, healthy environment.

Keywords: - Herbal dhoop, malaria,mosquito,Tuls,Lantana camara.

INTRODUCTION

Background:

Mosquitoes, belonging to the family Culicidae, encompass 3,600 species. These small flies have a slender segmented body, one pair of wings, three pairs of long, hair-like legs, and

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 1, 2023

specialized, highly elongated, piercing-sucking mouthparts. While all mosquitoes drink nectar from flowers, the females of certain species have also adapted to drink blood. The mosquito life cycle consists of four stages: egg, larva, pupa, and adult. Eggs are laid on the water surface and hatch into motile larvae that feed on aquatic algae and organic material [1].

Disease Transmission:

Mosquitoes are vectors for diseases such as chikungunya, dengue fever, and malaria. For disease transmission to occur, favorable seasonal conditions, such as humidity, temperature, and precipitation, are necessary. El Niño influences the location and frequency of outbreaks in regions like East Africa, Latin America, Southeast Asia, and India[2]. Climate change impacts these seasonal factors, altering the dispersal patterns of mosquitoes. Climate models, using historic data, can recreate past outbreaks and predict the risk of vector-borne diseases based on forecasted climate conditions. Mosquito-borne diseases have historically been most prevalent in East Africa, Latin America, Southeast Asia, and India[3]. However, an emergence in Europe was observed early in the 21st century. By 2030, southern Great Britain is expected to have a climate suitable for the transmission of Plasmodium vivax by Anopheles mosquitoes for two months each year, and by 2080, southern Scotland may experience similar conditions. Additionally, dengue fever is spreading northwards as climate change progresses [4].

Environmental Impact and Disease Transmission:

Mosquitoes play a crucial role in diverse ecosystems. Insect repellents, applied to the skin, provide short-term protection against mosquito bites and the diseases they can transmit [5].

Ecosystem Role:

Mosquitoes play an important role in ecosystems by serving as a food source for various organisms such as birds, bats, and fish. However, their ability to spread diseases to both humans and animals is a significant concern [6].

Disease Transmission:

Mosquitoes are vectors for diseases like malaria, dengue fever, Zika virus, yellow fever, and West Nile virus. When a mosquito feeds on an infected host, it can acquire the pathogen and subsequently transmit it to new hosts during future blood meals. This capability makes mosquitoes a major public health concern worldwide [7].

Types of Mosquitoes and Associated Diseases :

1. **Aedes Mosquito:** Known for transmitting diseases such as dengue fever, yellow fever, West Nile fever, and Zika virus. They are identifiable by the distinct white and black markings on their legs and body[8].
2. **Aedes albopictus (Asian Tiger Mosquito):** Responsible for spreading viral pathogens like yellow fever, Zika fever, and dengue fever. It also carries filarial nematodes such as Dirofilaria immitis. This species is commonly found in tropical and subtropical regions, especially in Southeast Asia.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 1, 2023

3. **Anopheles Mosquito (Marsh Mosquito):** Known for transmitting malaria, encephalitis, and Dirofilaria immitis. They thrive in colder climates as well.

Public Health Impact:

The ability of mosquitoes to transmit a wide range of diseases makes them a critical public health concern in many regions around the world. Efforts to control mosquito populations and prevent disease transmission are essential to protect human and animal health.

Mosquito Repellent Dhoop

Dhoop sticks emit calming scents that help soothe the mind and create a peaceful atmosphere. Many plants have mosquito-repelling properties, which are essential for disease prevention. Being made from natural plant materials, these dhoop sticks are environmentally friendly and typically do not cause adverse effects. They provide effective mosquito protection without any negative side effects.

While natural mosquito coils are efficient and practical, synthetic coils can be hazardous due to their adverse effects. Herbal dhoop sticks serve as an ideal alternative to commercial mosquito repellents, which contain harmful chemicals that can impact both human health and the environment [9].

Materials and Methodology

Sr.No	Botanical name	Common name	Properties	Protection against mosquito
1.	Azadirachtaindica	Neem	Antiviral,antibacterial	Yellow fever mosquito
2.	Ocimumtenuiflorum	Tulsi	Antifungal	Yellow fever mosquito
3.	Lantana camara	Lantana	Antimicrobial	Aedes mosquito
4.	Cleome rutidosperma	Rooster tree	Analgesic,antioxidant	Yellow fever mosquito
5.	Eucalyptuscitriodora	Eucalyptus oil	Antiviral	Filarial mosquitoes

Formulation table:-

Sr.No.	Ingredients	F1	F2	F3	Uses
1.	Neem powder	1 gm	-	1 gm	Insecticide mosquito repellency
2.	Tulsi powder	1 gm	-	1 gm	Insecticide
3.	Rostertree powder	-	1 gm	1 gm	Insecticide
4.	Lantana powder	-	1 gm	1 gm	Insecticide
5.	Marigold powder	1 gm	1 gm	1 gm	Smoke masking agent
6.	Sandalwood powder	1.5 gm	1.5 gm	1 gm	Healing agent
7.	Coconut fiber	2 gm	1.5 gm	1 gm	Binding agent
8.	Clove	0.5 gm	0.5 gm	0.5 gm	Spicy Fragrance
9.	Camphor	0.5 gm	0.5 gm	0.5 gm	Air purifier
10.	Cinnamon	0.5 gm	0.5 gm	0.5 gm	Mood booster

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 1, 2023

Method of Preparation

1. Accurately weigh all the powders according to the formula and mix them thoroughly using a mortar and pestle.
2. Shed dry the marigold petals, coconut fiber, cinnamon, and clove, then powder them using a domestic grinder. Combine these powders with the initial mixture.
3. Add the fine powder of camphor to the mixture.
4. Incorporate sandalwood powder and clarified butter, mixing thoroughly.
5. Finally, add rose water, eucalyptus oil, and perfume. Mix well in the mortar and pestle until a uniform, damp mass is formed.
6. Shape the mixture into dhoop sticks and dry them in the shade.

Figure 1: Mosquito repellent dhoop

Evaluation of Mosquito Killing and Repellent Dhoop from Herbal Ingredients

1. **Organoleptic Characters:** Evaluate the color, odor, and appearance of the dhoop using visual inspection.
2. **Moisture Content:** Record the initial weight of the prepared dhoop, then ignite it and note the final weight after drying.
3. **Ash Value:** Burn the dhoop stick completely, collect the ash, and weigh it.
4. **Mosquito Landing Test:** Have a person sit in a room with the burning dhoop and count the number of mosquitoes that land on their exposed skin over a set period, such as 5 minutes.
5. **Fume Test:** Detect the color and smell of the fumes released when the dhoop is burned to identify the presence of specific compounds.
6. **Irritability Test:** Check if the prepared dhoop causes any irritation to the skin.
7. **Mosquito Killing Time:** Assess the effectiveness of the dhoop by measuring how quickly it kills mosquitoes.
8. **Burning on Users:** Distribute the mosquito dhoop to people living in the area and observe any effects such as coughing or eye irritation.

RESULT AND DISCUSSION

Evaluation of Mosquito Killing and Repellent Dhoop from Herbal Ingredients

1. **Organoleptic Characters:**
    - **Color:** Black
    - **Odor:** Musk

- **Appearance:** (Details omitted)

2. **Moisture Content:**
   - Initial weight of one Dhoop: 2.863 g
   - Final weight of dried Dhoop: 2.388 g
   - Moisture content: Initial weight−Final weightInitial weight×100\frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100Initial weightInitial weight−Final weight×100
   - Calculation: 2.863−2.3882.863×100=9.60%\frac{2.863 - 2.388}{2.863} \times 100 = 9.60\%2.8632.863−2.388×100=9.60%
3. **Ash Value:**
   - Weight of ash: 0.20 g

Sr. No	Test	F1	F2	F3
4.	Mosquito landing Test	15 min	10 min	5 min
5.	Fume Test	Poor	Good	Good
6.	Irritability Test	Less skin irritation	Less skin irritation	No Skin irritation
7.	Mosquito killing time test	Very slow effective	Very slow effective	Slow effective
8.	Burning on users	No any harmful effect on users	No any harmful effect on users	No any harmful effect on users

Conclusion

In summary, this project report focuses on the creation and evaluation of a herbal-based mosquito-killing and repellent dhoop. The study extensively explores the development process of an eco-friendly method for mosquito control. By using specific herbal components known for their mosquito-repelling and insecticidal properties, the experiments conducted in controlled environments show positive results, indicating their effectiveness in incapacitating and eradicating mosquitoes. In conclusion, the project report highlights the potential of utilizing herbal ingredients to produce a dhoop that is both environmentally sustainable and safe for addressing mosquito-related issues. The formulated herbal dhoop stick proves to be effective, cost-efficient, and non-toxic compared to currently available chemical-based mosquito repellents, promoting a mosquito-free and healthy environment for society.

REFERENCES:

1. Hindustan A. A., Kishore K. R. B., Chitta . K., Krishna P. U., Ravindra. B.V., handra S. K., Anil K. G., Vamsi M. G: Formulation and Evaluation of Home Made Poly HerbalLiquid Mosquito Repellent, JITPS 2010, 1 (2), 98–105.
2. Ibrahim S. I, Fakhraddeen Y. M., Hauwa U. A.: Mosquito repellent activity of leaf and seed extract of Azadirachtaindica (neem), Journal of Malaria Research and Phytomedicine 2019, 3 (1), 19-23.
3. Sharma P. B., Borthakur S. K.: Formulation of an herbal mosquito repellent, Annals of Plant Sciences 2016, 5 (12), 1463-1465.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 1, 2023

4. Amin A., Mehdi K., Alireza Z. R., Sahar A., Effectiveness Hussain of S. M.: plant-based repellents against different Anopheles species: a systematic review, Malaria Journal 2019, 1-20
5. Mendhekar S. Y., Bodke N. N., Thorat P. B., Jadhav S.L., Gaikwad D.D.: Formulation and evaluation of polyherbal mosquito repellent creams (ointment type) with extra skin nourishing impact, World Journal of Pharmacy and Pharmaceutical Sciences 2017, 6(12), 1731-1742.
6. Ponkiya N., Desai S., Mistry J., Patel S., Ingalhalli R., Development of economical mosquito repellent using marigold plant, International Journal for Research Trends and Innovation 2018, 3(11), 47-54.
7. Sahu B., Dutta S., Mishra S. P., Khute S., Kumar L., Gupta A. S., Dewangan K.: A brief review on dhoop and its properties, Journal of Preventive Medicine and Holistic Health 2021, 7(1), 3–9.
8. Trivedi A., Rai P. and Jitendra Kumar: Formulation of low smoke herbal mosquito repellent sticks by using different essential oils, The Pharma Innovation Journal 2018, 7(4) 173-175.