Formulation and Evaluation of Mosquito Killing and Repellent Dhoop from Herbal Ingredients

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Abstract: The current study focuses on the development and assessment of a dhoop that kills and repels mosquitoes utilising herbal elements including Neem leaves powder, Orange peel powder, Camphor, Eucalyptus oil, Pharmaceutical perfume, Cow dung powder, Coconut shell powder, and Rose water. The developed formulation's ability to repel mosquitoes was tested for effectiveness. In a laboratory, the herbal insect repellent dhoop is made by hand-shaping the ingredients, and a pharmaceutical perfume is added for flavour. The efficacy of Formulations F1, F2, and F3 was produced and assessed. Compared to the F1 and F2 formulations, the F3 formulation has a stronger repelling activity. Synthetic mosquito repellent has a number of negative side effects, including lung cancer, anxiety, fremor, neurological effects, and olfactory impacts. There are numerous formulas of mosquito repellent available on the market.

***Index Terms*- Mosquito repellents, Dhoop, Herbal ingredients, Mosquito control.**

INTRODUCTION

A sort of mosquito-repellent product made with herbal or natural elements is referred to as "herbal mosquito dhoop". The traditional aromatic material known as dhoop, commonly referred to as incense, is burned to produce fragrant smoke. Herbal mosquito dhoop is specifically made to kill or repel mosquitoes in the context of mosquito management by utilising the characteristics of chosen herbal ingredients.

Herbal mosquito dhoop normally consists of a mixture of plant extracts, essential oils, and other organic substances that have been shown via tradition or research to have insecticidal or mosquito-repellent characteristics. These components were carefully chosen to maximise their ability to repel mosquitoes, lessen mosquito bites, or completely get rid of insects in the region.

When the dhoop is burned, smoke is released that contains the medicinally effective chemicals found in the herbal components. The smoke serves as a vehicle for releasing the insecticidal or repellant qualities into the surrounding area, forming a barrier or unfavourable conditions for mosquitoes. This can aid in lowering mosquito populations, preventing mosquito bites, and offering defence against diseases spread by mosquitoes.

Infectious diseases spread by mosquitoes constitute a serious threat to world health, killing millions of people each. Traditional mosquito control techniques, such insecticide coils and sprays, frequently use dangerous chemicals that could harm both people and the environment. The interest in creating safer and more sustainable alternatives to address mosquito-related problems has grown in recent years.

Mosquitoes, small insects belonging to the Culicidae family, have a three-part anatomy consisting of the head, thorax, and abdomen. The mosquito's head contains sensors that help it locate and feed on both humans and animals. Its head features large compound eyes with numerous lenses that can detect even slight movements. Additionally, there are simple light-sensitive eyes on top of their heads for detecting changes in light. Positioned in front of their heads are long feathery antennae housing sensitive receptors that can sense carbon dioxide in human breath from distances exceeding 100 feet. The maxillary palp, situated between the antennae, detects scents like octenol and other chemicals released in human sweat. Between the antennae lies the proboscis, a long-serrated mouthpart used for penetrating the skin and drawing blood.

Connected to the head, the thorax includes a pair of wings and six legs extending from it, each ending in tiny claws that assist mosquitoes in clinging to surfaces. The abdomen hangs from the thorax and

functions as the mosquito's stomach and lungs. Normally, both male and female mosquitoes feed on plant juices. While male mosquitoes do not bite humans, female mosquitoes begin biting humans after mating with males, as they require the protein from human blood for their egg maturation. Consequently, certain female mosquitoes act as carriers for diseases. Typically, these mosquitoes transmit diseases from one human or animal to another by acquiring a virus or parasite during a blood meal from an infected host. Although the virus and mosquito do not harm each other, the virus reproduces inside the mosquito. Subsequently, the mosquito transmits the viruses to other humans while feeding.

Environmental Impact and Disease Transmission:

Mosquitoes play a crucial role in diverse ecosystems by acting as a food source for various organisms like birds, bats, and fish. Nevertheless, their capacity to spread illnesses to both humans and animals is a notable worry. Mosquitoes are the carriers of diseases such as malaria, dengue fever, Zika virus, yellow fever, and West Nile virus.

When a mosquito feeds on an infected host, it can pick up the pathogen, which might then be transferred to a new host when it takes subsequent blood meals. The mosquitoes' capability to transmit diseases makes them a significant public health concern in numerous regions around the globe.

The different types of Mosquitoes and diseases caused by them are given below: [4]

1.Aedes Mosquito:

The Aedes mosquito is the culprit behind diseases like Dengue fever, yellow fever, West Nile fever, and Zika virus. These mosquitoes are recognizable by the distinct white and black markings on their legs and body.

2.Aedes albopictus:

The Aedes albopictus, also known as the Asian tiger mosquito, is responsible for transmitting various viral pathogens such as yellow fever, Zika fever, and dengue fever. It's also a carrier for certain filarial nematodes like dirofilaria immitis. This mosquito species is commonly found in tropical and subtropical regions, particularly in Southeast Asia.

3.Marsh Mosquito (Anopheles Mosquito):

Malaria, encephalitis, and dirofilarial immitis are attributed to them. They thrive in colder climates as well as tropical areas, with a significant presence in sub-Saharan Africa.

4.Yellow fever Mosquito:

These mosquitoes are to blame for illnesses like dengue fever, Zika fever, and yellow fever. Originally appearing in African nations, they have now spread to tropical and subtropical areas worldwide.

MATERIALS: Mosquito Killing and Repellent Ingredients

1. Neem (Azadirachta indica):

Azadirachta indica, commonly known as Neem, possesses potent properties as an insect anti-feedant. It effectively disrupts metamorphosis, particularly when moth larvae consume it at very low concentrations. Apart from azadirachtin, other compounds like salanimsalanim, gedunin, azadinone, nimbin, nimbidine, nimbicidine, and nimitinolare, classified as significant liminoids, also exhibit remarkable effects against insects and pests. The active components of Azadirachta indica hinder insect growth by influencing their life cycle. Fresh Neem leaves were sourced from the herbal garden at Ashokrao Mane College of Pharmacy, Peth Vadgaon, then cleansed with tap water and dried under sunlight over a span of four consecutive days.

2. Orange Peel Powder

Orange peel powder demonstrates larvicidal effects on mosquito larvae due to its bioactive constituents like flavonoids and terpenes. These components disrupt the mosquito life cycle by acting on their larvae, making orange peel powder a valuable element in mosquito management strategies, particularly for eradicating breeding locations.

3. Cow Dung powder:

Cow dung powder can be easily found in numerous rural regions where cattle are frequently raised. It is also cost-effective in comparison to conventional mosquito repellents. These aspects of its availability and affordability render cow dung powder a feasible choice for mosquito management, particularly in areas with limited resources.

Cow dung is a natural and organic material, establishing it as an eco-friendly alternative for mosquito control. Unlike mosquito repellents containing chemicals, the use of cow dung powder does not present notable hazards to human well-being or the environment, provided it is employed correctly.

4. Coconut shell powder:

Utilizing coconut shell powder as a potential organic mosquito repellent has displayed promise. The scent and components found in the powder have the capability to discourage mosquitoes, thus preventing them from coming into contact with people or biting them. Integrating coconut shell powder into mosquito repellent formulas could potentially amplify their efficacy in fending off mosquitoes and lowering the chances of mosquito-related illnesses.

Coconut shell powder is generally deemed safe for external application and is less likely to induce skin discomfort or allergic responses when compared to artificial chemicals. This renders it a viable alternative for people with sensitive skin or those who prefer natural and safer choices for managing mosquito presence.

5. Camphor

Camphor is obtained from either the wood of the camphor tree or through synthetic methods using natural precursors. Its origin in nature and its minimal toxicity render it a eco-conscious substitute for chemical mosquito repellents. Camphor easily breaks down and doesn't linger in the environment, lessening its ecological consequences.

6. Eucalyptus Oil:

Eucalyptus oil is renowned for its potent abilities as a mosquito repellent. This is due to the presence of citronellal, a natural compound known for its mosquito repellent properties. The oil functions by disguising the chemicals that draw mosquitoes, thus impeding their ability to find and bite humans. When included in repellent blends, eucalyptus oil can establish a shield that deters mosquitoes, consequently lowering the likelihood of mosquito-related illnesses.

7. Pharmaceutical Perfume:

Aromas have the potential to influence mood and feelings positively. Medicinal scents used in perfumes can induce feelings of calmness, coziness, or invigoration when used as mosquito repellents. This has the potential to enhance outdoor experiences and ease the tension or unease linked with places where mosquitoes are prevalent.

8. Rose Water:

Rose water is thought to have inherent repellent qualities due to its fragrance. Mosquitoes are known for being responsive to potent odors, and the scent of rose water could potentially deter them. Although there is a lack of extensive scientific research exclusively concentrating on rose water's mosquito-repellent effects, its enjoyable aroma might function as a mild deterrent.

Formulation of Mosquito Killing and Repellent

Table no.1- Formulation Table

Sr .No	Ingredients	F1	F2	F3	Role
1	Neem leaves powder	10 gm	7 gm	5 gm	Insecticide mosquito repellency
2	Orange peel powder	4 gm	3 gm	2 gm	Insecticide
3	Camphor	4 gm	3 gm	2 gm	Air purifier
4	Eucalyptus oil	1 ml	1ml	1ml	Natural mosquito repellency
5	Pharmaceutical perfume	1 ml	1ml	1ml	Flavoring agent
6	Cowdung powder	4 gm	2gm	2 gm	Bio-fuel
7	Coconut shell powder	1 gm	1gm	1gm	Binding agent
8	Rose water	Qs	Qs	Qs	Natural ingredients

Fig.No.1. Mosquito Killing and Repellent Dhoop

Methods of Preparation:

1.Gather neem leaves and orange peels, ensuring they are clean. Proceed to sun-dry them for 3 to 4 days until fully dehydrated.

2.Once dry, finely crush the neem leaves and orange peels to transform them into a powdered form.

3.This powdered mixture should then be sifted through a No. 80 sieve to achieve a smoother texture.

4.Next, crush camphor into a fine powder using a mortar and pestle, then pass it through a No. 80 sieve as well.

5.Prepare coconut shells by manually crushing them by hand, collecting the resulting dry pieces and sifting them through a No. 80 sieve.

6.Accurately crush camphor using a mortar and pestle and sift it through a No. 80 sieve. Combine it with

eucalyptus oil and pharmaceutical perfume (1ml) precisely.
7.Carefully measure all the ingredients and place them step by step into a mortar.
8.Gradually add an adequate amount of rose water to form a batter, shaping it into dhoop-like structures.
9.Sun-dry the formed dhoop until they are completely rigid and thoroughly dry.
10.Subsequently, carry out an assessment of the final product.

Evaluation of Mosquito Killing and Repellent Dhoop From Herbal Ingredients:
1.Mosquito Landing Test:
This test involves counting the number of mosquitos that land in a persons exposed skin when they are in the vicinity of the dhoop. To perform this test, you can have a person sit in a room with the dhoop burning and count the number of mosquitos that land on their skin in a set period, such as 5 minutes.
2.Fume Test:
A fume test is used to detect the color and smell if the fumes that are released when a product is burned, to identify the presence of specific compounds
3.Irritability Test:
The irritability test is performed to check that whether the prepared the dhoop cause any irritation to the skin
4.Mosquito Killing Time:
This test is performed to check the effect of mosquito killing either slow or fast.
5.Burning on Users:
The test was done by giving mosquito dhoop to the persons living in the area and investigate the effect like coughing, tears were observed.

RESULT AND DISCUSSION:

Table no.2- Result and Discussion.

Sr. No	Test	Formulations		
		Fl	F2	F3
1	Mosquito landing Test	15min	10min	5min
2	Fume test	Poor	Good	Good
3	Irritability test	Less Skin Irritation	less Skin Irritation	No Skin Irritation
4	Mosquito killing time Test	Very slow effective	Very slow effective	Very slow effective
5	Burning on users	No any harmful effects on users	Na any harmful effects on users	No any harmful effects on users

The results obtained indicate that the F3 formulation is superior in terms of both safety and effectiveness when compared to the F1 and F2 formulations. This research successfully developed and assessed a dhoop (mosquito-repelling incense) that can both repel and kill mosquitoes. The dhoop incorporates a combination of specifically chosen herbal ingredients with properties that can effectively eliminate mosquitoes when the dhoop's smoke is released. It is important to highlight that while the study presents promising findings, there are certain limitations that need to be acknowledged. The efficiency and repellent effects of the dhoop might differ based on factors such as the type of mosquito, concentration of active ingredients, and environmental circumstances. Further investigations could focus on refining the formulation and testing its performance against a wider array of mosquito species.

CONCLUSION

In summary, the project report focuses on creating and assessing a herbal-based mosquito-killing and repellent dhoop. The study thoroughly examines the process of developing an environmentally friendly approach to mosquito control. By utilizing specific herbal components known for their mosquito-repelling and insecticidal qualities, the experiments conducted in controlled settings demonstrate positive outcomes, indicating their efficacy in incapacitating and eradicating mosquitoes. To conclude, the project report underscores the viability of harnessing herbal elements to produce a dhoop that is both ecologically sound and harmless for addressing mosquito-related issues.

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