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CHRYSANTHEMUM BASED SMOKE PILLS FOR MOSQUITO REPELLENCE

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Abstract : Diseases such as dengue, malaria and Zika virus transmitted by mosquitoes, represent critical public health challenges and are responsible for millions of fatalities each year. Many chemical-based mosquito repellents carry risks due to their toxic components. This research introduces a herbal smoke pill formulated from Chrysanthemum flowers along with natural substances like Neem, Tulsi, Pudina, Sandalwood, Camphor and Guggul. These pills are free from harmful chemicals, ensuring safety and environmental friendliness. Experimental evaluations have confirmed their effectiveness in repelling mosquitoes, reducing populations and mitigating associated health hazards. The findings highlight a sustainable and safer alternative to conventional chemical repellents.

IndexTerms - Chrysanthemum, mosquito repellent, herbal smoke pills, non-toxic, eco-friendly.

1.INTRODUCTION

Mosquitoes are among the most dangerous insects due to their role as carriers of numerous deadly diseases such as malaria, dengue fever, chikungunya and Zika virus. Their life cycle comprises four distinct stages: egg, larva, pupa and adult with each stage adapted for both aquatic and terrestrial environments. Female mosquitoes requiring blood meals for egg production act as primary vectors for pathogens affecting millions globally. Malaria for instance is caused by Plasmodium parasites transmitted through Anopheles mosquitoes while Aedes species are responsible for spreading dengue and Zika viruses and Culex mosquitoes transmit diseases such as filariasis and West Nile virus.

Despite their widespread use chemical mosquito repellents like those containing DEET(N, N dimethyl-m-toluamide) are associated with adverse effects including respiratory problems skin irritation and environmental harm. This study introduces an alternative approach by formulating a natural herbal-based mosquito repellent using Chrysanthemum flowers. Renowned for their insecticidal properties, Chrysanthemum flowers contain pyrethrins, which effectively disrupt the mosquito nervous system. Pyrethrins bind to voltage-gated sodium channels leading to continuous depolarization and eventual paralysis. Furthermore, these compounds inhibit ATPase enzymes disrupting energy production and ultimately causing the insect's death. By utilizing these mechanisms, Chrysanthemum-based repellents offer a highly effective, eco-friendly and safer alternative to synthetic chemical repellents.

Objectives involves:

- Assess the efficacy of the formulation against different species of mosquitoes.
- Evaluate the duration of repellent action and the mortality rate of mosquitoes.
- Perform a comparative analysis with commercially available mosquito repellents.
- Investigate the correlation between dosage and repellent effectiveness.
- Validate the safety and non-toxic properties of the product for human use.

2. Materials and Methods

2.1 List of ingredients

Table 1: formulation

Ingredients	Concentration 1	Concentration 2
Chrysanthemum powder	1.5g	3g
Neem powder	1g	1g
Tulsi powder	1g	1g
Pudina powder	1g	1g
Sandalwood powder	1g	1g
Starch	2g	2g
Camphor	5g	5g
Guggul	5g	5g
Raal	5g	5g
Cow dung	4g	4g
Cow gee	5g	5g
Lemongrass essential oil	1ml	1ml
Rose water	quantity sufficient	quantity sufficient

2.2 Collection and Preparation of Ingredients: Fresh Chrysanthemum flowers, Neem leaves, Tulsi leaves, Pudina leaves, Sandalwood powder, Camphor, Guggul and other natural materials were sourced with care. Each plant material was washed thoroughly with clean water to remove any contaminants. The cleaned materials were then dried in a shaded, well-ventilated environment to maintain their bioactive compounds. Once dried, the materials were ground into fine powders using a grinder, ensuring uniform particle size. The powders were then sieved to remove any coarse particles, resulting in a smooth and consistent mixture.

2.3 Formulation: The formulation process began by measuring the powdered ingredients in precise proportions. Chrysanthemum powder, Neem powder, Tulsi powder, Pudina powder, Sandalwood powder and crushed Camphor were thoroughly blended in a large mixing bowl. Gradually, Cow dung, Guggul powder and Cow ghee were added to the dry mix to achieve a cohesive texture. Lemongrass essential oil and Rose water were then incorporated incrementally to form a moldable paste. This mixture was shaped into uniform spherical pills by hand. The pills were arranged on parchment-lined trays and left to air dry for 48 hours in a cool, dry location. Alternatively, a dehydrator or an oven set at a low temperature of around 65°C was used to speed up the drying process without degrading the active components.

2.4 Bioassay: To assess the mosquito repellent efficacy of the prepared smoke pills, controlled laboratory experiments were conducted. A predetermined number of mosquitoes were introduced into a mesh cage. A single smoke pill was ignited and allowed to burn entirely within close proximity to the cage. Observations were made to record the number of mosquitoes that were repelled, immobilized or killed. The duration of burning and the density of the emitted smoke were also evaluated to determine the practicality and efficiency of the formulation. Experiments were conducted using varying concentrations of Chrysanthemum powder to compare their effectiveness. Each test was repeated three times to ensure consistency and accuracy of results.

2.5 EVALUATION OF SMOKING PILL

2.5.1 Physical Analysis

The mosquito repellent pill was assessed for its physical attributes, including its color and odor. The pill exhibited a dark green to black hue, and its odor was characteristic of the natural components incorporated in the formulation.

2.5.2 Flammability and Burning Duration

The flammability and burning time of the pill were examined by igniting the sample. The pill underwent complete combustion with a burning duration of 16–17 minutes recorded consistently.

2.5.3 Smoke Visibility

The duration for which the smoke remained visible was measured to determine its effectiveness as a mosquito repellent. Prolonged visibility of the smoke suggests enhanced performance in repelling mosquitoes and maintaining a persistent deterrent effect. This also provided insights into the safety and user-friendliness of the product.

2.5.4 Mosquito Protection

The repellent's efficacy was evaluated under controlled conditions, where mosquitoes were introduced into the treated space. The number of landings and bites in the treated area was compared to an untreated control to gauge effectiveness. The pill provided effective mosquito protection for 2–3 hours.

3. Results and Discussion

3.1 Results

The mosquito-repellent properties of chrysanthemum flower extract were tested at two concentrations: 1.5 g and 3 g. Results demonstrated that the 3 g concentration was significantly more effective causing the death of 3 mosquitoes and rendering 3 unconscious. In contrast, the 1.5 g concentration showed reduced efficacy, with 2 mosquitoes killed, 2 rendered unconscious, 1

escaping and 1 remaining active (Table 2). This suggests that a higher dose of chrysanthemum extract enhances mosquito control effectiveness. Chrysanthemum flowers are known to contain pyrethrins, which are natural compounds with strong repellent properties against mosquitoes, including those that act as disease carriers. Furthermore, chrysanthemum-based repellents are environmentally safe and represent a sustainable alternative to chemical repellents with minimal health risks.

Table 2: Report

Report	Concentration 1 (1.5 g)	Concentration 2 (3 g)
No. of mosquitoes	6	6
No. of mosquitoes escaped	1	-
No. of mosquitoes unconscious	2	3
No. of mosquitoes died	2	3
No. of mosquitoes survived	1	-
Burning time	20	20

3.2 DISCUSSION

The use of chrysanthemum flowers as a natural mosquito repellent presents a promising alternative to synthetic chemical-based options. The primary active ingredients, known as pyrethrins are widely recognized for their effectiveness in repelling and disabling mosquitoes. This aligns with the increasing demand for safer, natural and eco-friendly repellent solutions, particularly in areas heavily affected by mosquito-transmitted diseases. A key benefit of chrysanthemum-derived repellents is their relatively low risk of side effects, making them suitable for extended use, especially among vulnerable groups such as children and pregnant women. Moreover, their biodegradability offers a notable advantage over synthetic chemicals like DEET, which often pose environmental risks.

Nevertheless, challenges remain such as the need for sustainable agricultural practices to support large-scale cultivation and extraction of pyrethrins. Additionally, while natural repellents show promise their effectiveness may be reduced by environmental factors like humidity and rain, potentially offering shorter-lasting protection compared to synthetic alternatives. Further research is needed to improve the stability and cost-effectiveness of these formulations for broader use.

In summary, chrysanthemum-based repellents hold significant potential as a safer and more environmentally friendly alternative for mosquito control. However, continued innovation and investment are necessary to unlock their full potential and ensure their widespread applicability.

4. CONCLUSION

This study shows that a mosquito repellent made from cow dung and plant extracts is an effective and eco-friendly alternative. The pill-based formulation offers a safe, long-lasting solution to synthetic repellents being affordable, easy to use and environmentally conscious. By incorporating natural ingredients such as cow dung and chrysanthemum, this approach could create economic opportunities. In conclusion, it provides a cost-effective, non-toxic alternative that reduces the risk of mosquito resistance and offers a more sustainable option than traditional repellents.

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