

FORMULATION AND EVALUATION OF POLYHERBAL INSECT REPELLENT SPRAY

Jyoti Gheji*, Prajakta Omana Patil, Suraj Sanjay Pawar, Pranjal Santosh Bagadi, Riya Rajesh Bharati and Rohini Mallappa Sutar

India.

Article Received on
05 April 2025,

Revised on 25 April 2025,
Accepted on 15 May 2025

DOI: 10.20959/wjpr202511-36777



***Corresponding Author**

Jyoti Gheji

India.

ABSTRACT

The present study aims to investigate the insect repellent properties of certain plant material to develop effective and safe herbal insect repellent formulation through combining these natural ingredients selected plant materials. This study explores the insect-repelling properties of specific plant materials to create a safe and effective herbal repellent, as an alternative to chemical-based products that can cause skin and health issues. An effort has been made to develop a 100% herb this was developed because chemical-based repellents can cause skin irritation, toxicity, and inflammation. The study revealed that the manufactured polyherbal spray was more effective, affordable, and non-toxic compared to commercially available sprays. Further

research is required to validate the efficacy and safety of the synthesized repellent for repelling insects and mosquitoes. The formulation underwent pH assessment and stability testing, revealing no turbidity or microbial growth over three months. The formulation demonstrated antimicrobial activity against *E. coli* (bacteria) and *Candida albicans* (fungus) via agar well diffusion assay.

KEYWORD: Insect, Repellent, Herbal extract, Essential oil.

INTRODUCTION

Insects are the most abundant and diverse group of organisms on the planet, representing the largest and most successful taxon. Insects are arthropods belonging to the class Insecta, characterized by a three-part body (head, thorax, and abdomen), six legs, and typically two pairs of wings. The class Insecta is divided into multiple orders, which are categorized into two sub-classes: Apterygota (wingless insects) Pterygota, or winged insects, are part of the

larger group of hexapods, which also includes three classes of non-insect six-legged arthropods.

MOSQUITOES

Mosquitoes are notorious blood-feeding insects that transmit diseases like malaria, dengue fever, and yellow fever through bites, with *Anopheles*, *Culex*, and *Aedes* species being primary vectors, triggering an immune response in humans through their saliva. The reactions result in irritations, itching, redness and sometime it develops into the bumps Mosquito saliva frequently causes an irritating skin reaction, leading to an uncomfortable rash and itching sensation. Mosquito bites can also trigger intense skin irritation due to an allergic response to the saliva injected during a bite. Mosquito's heat set of sensors that have the capability to track their preys presence

DRAIN FLY

Drain flies (*Psychoda* spp.) often rest near their breeding sites, such as bathroom walls and drains, where larvae feed on organic matter, and although they don't bite or transmit diseases, large numbers can trigger respiratory issues due to airborne scales from their bodies.

HOUSE FLY

Housefly (*Musca domestica*) exists a major pest of humans, poultry and livestock facilities throughout the world 4 House flies acts as carriers of disease-causing agents like bacteria (*Escherichia coli*, *Shigella*, *Salmonella* spp.) Which spread more than hundred diseases in humans and animals like amoebic dysentery, helminthic and rickettsial infections etc. Houseflies have been identified as potential vectors of the bird flu virus, posing a risk to human health and the poultry and livestock industries globally in developing countries like India, the transmission of diarrheal diseases is often associated with the seasonal increase of housefly populations. and by taking necessary steps to their control results in reduction of such disease.

METHDOLOGY: List of Ingredients.

Sr. No	Ingredient	F3	Role
1.	Nirgundi	6.5ml	Insect repellent
2.	Nilgiri	5.5ml	Mosquitoes' repellent
3.	Neem	5ml	Insecticide
4.	Lemongrass	2.5ml	Air freshener
5.	Merigold	2.5ml	Antioxidant
6.	Mentha	2.5ml	Anti-Bacterial

7.	SLS	0.2gm	Emulsifying Agent
8.	Methyl Paraben	0.3gm	Preservative
9.	Water	25ml	Vehicle

1. NIRGUNDI

Synonym: Vitex Nirgundi, Sambhalu, Chaste tree.

Biological Source: -Nirgundi consist of dried leaves of plant vitex nirgundo.

Family: Verbenaceae.

Uses: 1) Mosquito repellent activity. 2) Insecticidal and pesticidal activity.



2. NILGIRI

Synonyms: - Eucalyptus Camphora.

Biological Source: Nilgiri is consist of fresh and dried leaves from plant.

Family: Myrtaceae.

Uses: 1) Anti-inflammatory. 2) Bug spray



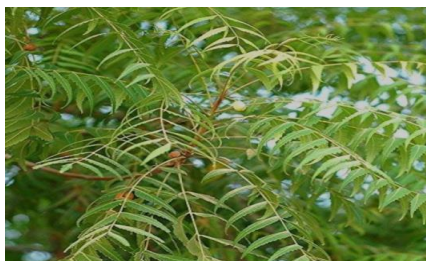
3. NEEM

Synonyms: Azadirachata Indica, Nira, Nimb, Margosa.

Biological Source: - Neem consist of fresh or dried leaves of plant Azadirachata

Family: Meliaceae.

Uses: 1) Antibacterial, Anticancer, Antimalarial, Antiviral.



4. LEMONGRASS

Synonyms: Malabar Grass, Cochin Grass.

Biological Source: lemongrass is obtained from *Cymbopogon Flexuosus*

Family: poaceae.

Use: 1) Mosquito repellent 2) Air freshener.

3) Natural pesticidal activity.



5. MARIGOLD

Synonyms: Cornflower, Mignonette.

Biological Source: Annual herbs of the aster.

family Asteraceae.

Use: 1) Antioxidant 2) Antibacterial 3) Anti-inflammatory.



6. MENTHA

Synonyms: -Mentha Arvensis L, Peppermint, Mentha Piperita

Biological Source: It consists of fresh leaves of plant Mentha Arvensis.

Family: Lamiaceae

Uses: 1) Antimicrobial. 2) Insects Repellent.

3) Anti Inflammatory. 4) Flavoring Agent.



PROCESS OF EXTRACTION

A. SOXHLET PROCESS

20gm Leaves powder material was extracted in 200ml of Ethanol (50%) By Soxhlet apparatus at 40 – 50 C for 10hr. Filter extract through Whatmann filter paper No.41 was used. Filtrate evaporated to dryness on a water bath maintained at 650 C, 3gm extract was collected. (eg. Nirgundi, Nilgiri, lemongrass)

B. MACERATION

0.5gm of sample were weighed and poured into a reagent bottle. 10 ml of distilled water was added to soak. After some minutes, proper filtration was carried out using filter paper. (eg. Neem, Mentha)

C. DECOCTION

Take a flower from the plant source. Crushed the flower and dissolved in dist. water and allow boiling in beaker over water bath for quick extraction for 2hr. the solution was filtered for immediate use.

METHOD OF PREPARATION OF HERBAL INSECT REPELLENT

1. Mix all the constituents in formulation table.
2. The spray formulation contained a total active ingredient concentration of 16% v/v
3. Distilled water was added to the mixture until the final volume was 50ml.
4. The constituents were mixed using the magnetic stirrer for one hour.
5. Finally, the mixture was poured into bottles.

EVALUATION TEST**1. Determination of pH**

It is done by using pH meter. It is adjusted by using phosphate buffer with pH values (4, 7, 9). Then determine pH of spray solution.

2. Evaporation time

Evaporation time is the time needed to dry the spray solution. It is measured by using or spraying the formulation on skin. Then note down the drying time.

3. Spray angle

Fix the paper on the wall. Press the spray from particular distance (h). Then draw the sprayed circle. Then measure the radius (r). Spray Angle $\tan^{-1}(h/r)$.

4. Spray pattern

It is done by using whatmann filter paper, The container kept at 5cm from paper and then sprayed. Then measure the radius and calculate the mean.

5. Leakage Test

Place the container in water. Kept it for 24 hours. Then check any leakage.

6. Average Weight per dose

Measure the weight of the spray (WI). Then spray the container at once and measure the weight again (W2). Average weight $(WI - W2) / \text{no of deliveries}$.

7. Irritancy Test

A small amount of the spray was applied on the skin and left on for few minutes.

8. In Vitro Antibacterial Activity

The anti-bacterial test is performed on the nutrient culture media using spray formulation. Take the inoculated Petri plate and makes the bors on it and then fills the prepared formulation and kept in incubator at 30-35⁰c Temperature for 2 days then measures the zone of inhibition.



RESULT AND DISCUSSION

Sr. No	Evaluation Test	Observation
1.	pH	6.85
2.	Evaporation Time	76 sec
3.	Spray angle	73.14 ⁰
4.	Spray pattern	5.3
5.	Leakage Test	No leakage
6.	Average Weight per dose	0.21
7.	Irritancy Test	No irritation
8.	Susceptibility test (Zone of inhibition)	11mm

CONCLUSION

Mosquito and insect are the causative agent for the most of disease and for the repellent and killing purpose there are various formulation are present in market like creams, solution's, gels, spray etc. In all of that the spray formulation are very effective and easy to apply and have various advantages. For the killing purpose the herbal ingredients are more beneficial and having less side effect. So, we choose the herbal ingredients like which have high insect repellent activities and are formulated in spray for better application and evaluated successfully. So from the various studies and result we have concluded that our prepared

formulation has a good insect repellent property as well as novel approach to insect repellency treatment. In this study, a polyherbal insect repellent spray was prepared using Nirgundi, Nilgiri, Neem, Lemongrass, Marigold, Mentha a medicinal plant known for its repellent activity. The plant is rich in alkaloids compounds, and phytochemical screening confirmed the presence of active constituents like flavonoids, alkaloids, terpenoids tannins and glycoside.

ACKNOWLEDGEMENT

Sincere thank you to principle my guide and management of Yashwant Redekar College of Pharmacy, Nesari, India for providing necessary facilities throughout this Research.

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