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"Harnessing Nature's Defense: Vitex Negundo Mosquito Repellent Encense For Effective And Sustainable Protection"

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ABSTRACT:

Mosquito-borne diseases remain a significant public health concern globally, necessitating effective preventive measures. This study explores the potential of Vitex negundo, a widely available medicinal plant, as a source for developing a natural mosquito repellent incense. Vitex negundo possesses various phytochemicals known for their insecticidal and repellent properties. The research involves the extraction of active compounds from Vitex negundo leaves through solvent extraction methods. These extracts are then incorporated into incense sticks using suitable binders and additives. The efficacy of the developed mosquito repellent incense is evaluated through laboratory assays and field trials against common mosquito species known to transmit diseases. Additionally, the safety profile of the incense is assessed to ensure its suitability for human use. The results demonstrate the potential of Vitex negundo-derived incense as an eco-friendly and sustainable solution for mosquito control, offering an alternative to synthetic repellents with minimal environmental impact. This research contributes to the development of affordable and accessible mosquito repellent products, particularly in regions where mosquito-borne diseases pose a significant threat to public health.

Key Words: Vitex negundo,mosquito repellent,insecticidal,Ecofreindly formulation.

INTRODUCTION:

Name: Vitex Negundo Linn.
Description: It is a woody plant primarily found in the Indian subcontinent and neighboring countries.
Characteristics:
Size: It can grow as an erect shrub or a small tree, reaching heights between 2 to 8 meters.
Bark: The bark is typically reddish-brown in color.
Leaves: The leaves are compound, consisting of three to five finger-like lanceolate leaflets. Each leaflet is 4 to 10 cm long, with the central leaflet being the longest and possessing a stalk. The leaf edges are toothed or notched, resembling a saw, and the bottom surface is covered with hair.
Flowers: Purple-white flowers are abundant, borne in panicles about 10 to 20 cm long. The petals vary in length, with the middle lower lobe being the longest. Both the corolla and calyx are densely covered in hairs. The flowers are fragrant and hermaphrodite, meaning they have both male and female reproductive organs and are pollinated by insects.(1)

TAXONOMICAL CLASSIFICATION:

Kingdom - Plantae – Plants
Sub Kingdom: Tracheobionta (Vascular plants)
Super Division: Spermatophyta (Seed plants)
Division: Magnoliophyta (Flowering plants)
Class: Magnoliopsida (Dicotyledons)
Subclass: Asteridae
Order –Lamilales
Family –Verbenaceae
Genus-Vitexlinn.
Species – Vitex negundo Linn. (Chaste tree).(2)

VERNACULAR NAMES:

Telugu :Vaavili
Tamil : Nirkundi,
Hindi : Shivari, Nirgundi

Punjab: Shwari
Assam : Aslok
Bengal : Nirgundi, Nishinda
Gujarati : Nagod
Marathi : Nirgundi
Punjabi : Sambhalu, Banna
Sanskrit :Nirgundi
English: five leaves chase tree(2)

Figure.1.

PHARMACOLOGICAL ACTIONS:(1,8,9,10)

The herbal plant Vitex negundo linn. Shows the following pharmacological actions:

1. Anti-inflammatory
2. Immuno stimulant
3. Mosquito repellent activity
4. Anti convulsant
5. Anti-oxidant
6. Antibacterial
7. Anti-fungal
8. Anti diabetic
9. Anti arthritic
10. Anti-allergic
11. Hepato protective
12. Analgesic
13. Anti-hyperpigmentstion
14. Anti-androgenic
15. Insecticidal and pesticidal
16. Anti-pyretic
17. Anti-microbial
18. Nephro protective
19. Anti-HIV activity
20. Astringent activity
21. Anxiolytic activity

Mosquito:
Mosquitoes are tiny insects that annoy and bite humans. Some types of mosquitoes, like Anopheles, Aedes, and Culex, can spread diseases when they bite. These diseases include malaria, dengue fever, Myiasis, yellow fever, and encephalitis.
Malaria is a serious illness caused by parasites carried by female Anopheles mosquitoes. There are four types of parasites that cause malaria: Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, and Plasmodium malariae. Malaria can make people very sick, with symptoms like high fever and chills.
According to reports from the World Health Organization (WHO) and the American Association of Mosquito Control, malaria caused more than half a million deaths in 2012. By 2018, the number of deaths had increased to one million.(3,4,5).

Anatomy of mosquitoes:
Mosquitoes are fascinating creatures with complex anatomy and behaviors that make them efficient vectors for transmitting diseases. Let's break down their anatomy and how they contribute to disease transmission in simpler terms.
Head: This is where the action starts for a mosquito. They have tiny sensors that help them detect their hosts, primarily humans or animals. Their eyes, although small, are quite sensitive to movement. Their feathery antennae are like super-sensitive sniffers, capable of detecting the carbon dioxide we exhale from up to about 100 feet away. They also use their maxillary palp, located near the antennae, to pick up on the odors humans emit, especially the ones from sweat.

Thorax: This part of the mosquito is connected to the head and is where you'll find their wings and six legs. Those tiny claws on their legs help them cling to surfaces.
Abdomen: Hanging from the thorax, the abdomen houses their stomach and lungs. Both male and female mosquitoes feed on plant juices, but it's the female mosquito that becomes a problem for us. After mating, she needs the proteins from our blood to develop her eggs. So, she uses her proboscis, which is like a needle-like mouthpart, to pierce our skin and suck our blood..(6,7)

Mosquito repellent activity:(12,13)
Mosquito repellent activity refers to the effectiveness of substances or products in preventing mosquitoes from landing on and biting humans**.** Understanding this activity involves looking at various factors such as the types of repellents available, their mechanisms of action, effectiveness, duration of protection, and safety.
Types of Mosquito Repellent:

1. Chemical Repellants.
2. Natural Repellants.

Application Methods:
Topical Application: Directly applied to exposed skin.
Clothing Treatment: Repellents like permethrin are used to treat clothing and gear.
Spatial Repellents: Include products like coils,incense, candles, and electronic diffusers that release repellent into the air.

FORMULATION AND EVALUATION OF MOSQUITO REPELLANT INCENSE:

Development of safe and herbal mosquito repellent incense sticks:

We've created a safe and natural mosquito repellent in the form of incense sticks. Traditional mosquito repellents often contain harmful chemicals that can be dangerous to both people and the environment. They're also not easily accessible to everyone, particularly those in rural areas.
Our product is different. It's made from herbal ingredients that have been used for generations in India to repel insects. These herbs are safe and readily available. Plus, because we use only natural ingredients, there are no synthetic chemicals involved.
Not only is our product effective at keeping mosquitoes away, but it's also affordable to produce. This means it's accessible to more people, helping to protect them from mosquito-borne diseases without harming their health or the environment.

Formulation Table:

TABLE NO.1

Serial no.	**Ingredients**	**Quantity taken(gm)**	**Uses**
1.	Vitex negundo Linn.	20	Mosquito repellant
2.	Saw dust powder	40	Base
3.	Camphor	10	Odour
4.	Bees wax	19	Binder
5.	Neem powder	9	Mosquito repellent
6.	Coconut oil	2	Softening of dough
7.	Water	Qs.	Binder

Method Of Preparation of Incense:

- Dry the vitex negundo linn and neem leaves by using sun drying.
- Part one contains the base material like saw dust powder,adhesive gum(Bees wax),camphor etc.
- Part two contains active ingredients like vitex negundo leaf powder and neem powder.
- All ingredients added in mortar with the sufficient amount.
- Add water as per requirement for proper binding of ingredients.
- Make the dough and rolled on bamboo sticks.
- Kept in hot air oven at 50 degree celcius for 6 hrs.
- Mosquito repellant incense are prepared. (11)

Figure.2

Figure.3

Figure.4

Figure.5

Figure.6

Figure.7

TABLE NO.2

Figure No.	Description
1.	Vitex negundo Linn. plant
2.	Vitex negundo powder
3.	Neem powder
4.	Saw dust powder
5.	Camphor powder
6.	Prepared dough
7.	Prepared Incense

Cage Test For Mosquitoes:

Testing mosquito repellent activity of incense sticks using mosquito net cage method:

The mosquitoes used in this experiment were caught by big plastic cover and transferred carefully in the net cage with approximately 60cm X 60cm. About 20 mosquitoes are transferred in the net cage between 7pm to 10pm since most of the mosquitoes bite at that time. The two full incense were burned in the room with sufficient ventilation and the mosquito net cage is kept at the center of the room and duration of exposure is 3 hours. The behavior of the mosquitoes was assessed. The behaviors of the mosquitoes were given in Table 3 and Figure 10 mosquitoes with no movement after 3 hours of exposure. Figure 9 shows the mosquito net cage.

TABLE NO.3.

Behaviour of the mosquitoes.	**7 to 8 pm**	**8 to 9 pm**	**9 to 10 pm**
Mosquitoes freely moving in the cage.	20	17	14
Mosquitos struggling for life.	7	9	12
No movement and lying on floor	11	15	18

Fig. No. 8

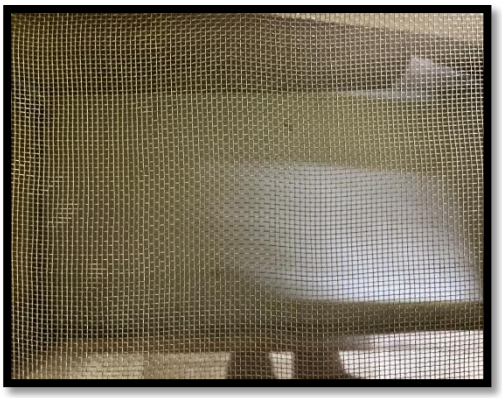

Fig. No. 9

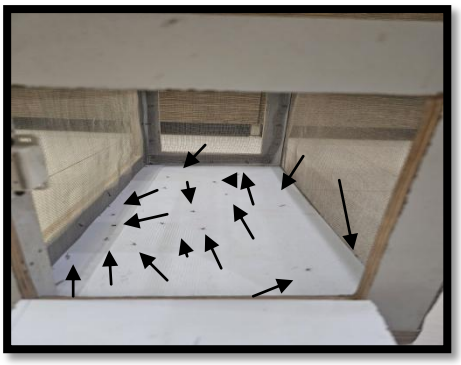

Fig.No.10

RESULTS:

The mosquito net cage method was used to assess the behavior of the mosquitoes when the incense were burned near the net cage for about 3hrs. Around 2 complete incense were burned near the net cage from 7 pm to 10 pm. The results are given in Table 3. and the mosquitoes with no movement lying on floor number noted every hour, the first, second and third hour result shows 11, 15, 18 respectively, whereas 2 mosquitoes aligned on the net after 3 hours. The figure 10 shows that mosquitoes with no movement after 3 hours of exposure.

CONCLUSION:

Before making the mosquito repellent incense,we read a lot of information to learn about it.. Plants have mosquito repellent activity like Vitex negundo, neem, camphor,was selected, powdered and made the incense by adding binders. The incense are subjected for evaluation by using mosquito net cage method and the results were very satisfactory in repelling the mosquitoes. The product also tested for any allergy symptoms when used and there is no such allergic symptoms like discomfort, sneezing, wheezing were reported In simple terms, the product is safe to use and really good at keeping mosquitoes away.

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