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Formulation of Herbal mosquito repellent liquid vaporizer of cinnamon and clove.

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ABSTRACT:

This research paper presents the formulation and evaluation of a herbal mosquito repellent liquid vaporizer derived from cinnamon and clove extracts. The study explores the taxonomical classification, biological sources, chemical constituents, and traditional uses of cinnamon and clove, emphasizing their efficacy in pest control. Through meticulous extraction and formulation processes, a potent repellent was developed, leveraging the synergistic properties of cinnamon and clove to create a safe, environmentally friendly alternative to chemical-based repellents.

The methodology involved the collection, identification, and processing of cinnamon bark, followed by steam distillation to extract essential oil. The formulation included a blend of cinnamon oil, clove oil, and other herbal ingredients such as eucalyptus and peppermint oils, combined with excipients like glycerin and ethanol. Evaluation tests, including macroscopic studies, determination of moisture content, and preliminary phytochemical screening, confirmed the quality and efficacy of the formulated repellent.

The conclusion highlights the promising potential of this herbal mosquito repellent, offering not only effective pest control but also additional health benefits and a pleasant aroma. The research underscores the importance of natural ingredients in addressing public health challenges, contributing to sustainable and eco-friendly pest management practices. Further studies are recommended to optimize formulations and enhance efficacy against different mosquito species, ultimately promoting health and well-being for individuals and communities.

Keywords: Herbal, Mosquito Repellent, Liquid Vaporizer, Cinnamon, Clove, Formulation, Evaluation, Taxonomical Classification, Biological Sources, Chemical Constituents, Traditional Uses, Extraction, Steam Distillation, Essential Oil.

Introduction:

Mosquito-borne diseases remain a significant global health concern, particularly in regions where these vectors thrive. Conventional mosquito repellents often contain synthetic chemicals that raise environmental and health-related apprehensions. In response, there is a growing interest in exploring natural alternatives derived from botanical sources. Among these, cinnamon (Cinnamomum verum) and clove (Syzygium aromaticum) have garnered attention for their potent insect-repellent properties and long-standing traditional use.

Cinnamon, extracted from the bark of the Cinnamomum tree, has been revered for its aromatic qualities and medicinal benefits for centuries. Its essential oil contains compounds such as cinnamaldehyde and eugenol, known for their insecticidal and repellent properties. Similarly, clove, derived from the flower buds of the clove tree, is rich in eugenol, a powerful insect repellent with proven efficacy against mosquitoes and other pests.

The formulation of a herbal mosquito repellent liquid vaporizer utilizing cinnamon and clove presents a promising avenue for combating mosquito-borne diseases while minimizing environmental impact and potential health risks associated with synthetic alternatives. By harnessing the natural repellent properties of these botanical extracts, it is envisaged to develop a formulation that not only repels mosquitoes effectively but also offers a safe and eco-friendly alternative for indoor mosquito control.

This research endeavors to explore the formulation of a herbal mosquito repellent liquid vaporizer utilizing cinnamon and clove extracts, evaluating its efficacy in repelling mosquitoes and providing long-lasting protection. Through meticulous experimentation and analysis, the aim is to elucidate

the potential of this botanical blend in meeting the evolving demands for effective mosquito control while also addressing concerns related to sustainability and human health.

In essence, this study seeks to bridge the gap between traditional knowledge and modern science, offering insights into the formulation of herbal mosquito repellents that harness the inherent protective properties of nature's bounty. As the global community continues to grapple with the threat of mosquito-borne diseases, the pursuit of natural solutions underscores a holistic approach towards safeguarding public health and well-being.

Material:

Cinnamon:

Fig No.1: Plant of *Cinnamomum verum* (cinnamon).

Taxonomical classification:

- Kingdom: Plantae
- Phylum: Angiosperms
- Class: Eudicots
- Family*: Lauraceae*
- Genus: Cinnamomum

Biological source:

The inner bark of trees belonging to the genus Cinnamomum, with the two main species being Cinnamomum verum (true cinnamon) and Cinnamomum cassia (cassia cinnamon).

Chemical constituent:

Cinnamon's chemical composition varies across different parts of the plant:

- Bark: Cinnamaldehyde is the predominant compound, comprising about 60-80% of the essential oil in cinnamon bark. Other constituents include eugenol, cinnamic acid, andProcyanidins.
- Leaves: Cinnamon leaves contain essential oils rich in compounds such as eugenol, linalool, and cinnamaldehyde, albeit in lower quantities compared to the bark.
- Roots and stems: These parts of the plant contain lower concentrations of essential oils and major compounds like cinnamaldehyde compared to the bark and leaves.
- Flowers and fruits: While these parts may contain traces of essential oils and aromatic compounds, they are not typically harvested for commercial use in the production of cinnamon.

Traditional uses of cinnamon:

- Culinary: Flavouring sweet and savoury dishes.
- Medicinal: Treating ailments, aiding digestion, and regulating blood sugar.
- Preservation: Preventing food spoilage.
- Fragrance: Adding warmth and aroma to perfumes and candles.
- Religious/Spiritual: Used in rituals for purification and prosperity.
- Dental Care: Freshening breath and preventing tooth decay.
- Cosmetic/Beauty: Improving skin texture and treating acne.

Clove:

Fig No.2: Plant of *Syzygium aromaticum* (Clove).

Taxonomical classification:

- Kingdom: Plantae
- Phylum: Angiosperms
- Class: Magnoliopsida
- Family: *Lauraceae*
- Genus: Cinnamomum

Biological source:

The dried flower buds of the clove tree, known scientifically as *Syzygium aromaticum*, belonging to the *Myrtaceae* family.

Chemical constituent:

The chemical composition of clove varies across different parts of the plant:

- **Flower buds:** The flower buds of clove contain the highest concentration of essential oils, particularly eugenol, which can make up around 70-90% of the oil content. Other constituents include eugenyl acetate, β-caryophyllene, and minor compounds such as α-humulene and caryophyllene oxide.

- **Leaves:** Clove leaves also contain essential oils, albeit in smaller amounts compared to the flower buds. The main components include eugenol, β-caryophyllene, and eugenyl acetate.

- **Stems:** Clove stems contain lower concentrations of essential oils compared to the flower buds and leaves. Eugenol is still a major constituent, along with smaller amounts of β-caryophyllene and eugenyl acetate.
- **Fruits:** Clove fruits, which are small, dark berries, contain fewer essential oils compared to the flower buds. The oil composition may vary, but eugenol is usually present, along with other compounds such as β-caryophyllene and eugenyl acetate.

Traditional uses of cloves:

- **Culinary:** Adding flavor to dishes, especially in savory dishes, desserts, and beverages.
- **Medicinal:** Relieving toothaches, aiding digestion, and treating respiratory conditions.
- **Preservation:** Used for its antimicrobial properties to preserve food.
- **Fragrance:** Adding a spicy aroma to potpourri, perfumes, and cosmetics.
- **Dental Care:** Soothing toothaches and gum pain.
- **Traditional Medicine:** Used in various cultures to treat digestive issues, colds, and coughs.

Excipient & uses:

Sr. No.	Ingredients	Uses
1	Clove oil	Mosquito repellent
2	Eucalyptus oil	Perfuming agent\ mosquito repellent
3	Papermint oil	Fragrance
4	Glycerin	Emulsifying agent
5	Ethanol	preservative

Table no. 1: Excipient and their uses

Method:

a) **Collection, identification & processing of Plant:**

The inner bark of trees belonging to the genus Cinnamomum, with the main species being *Cinnamomum verum* were collected from medicinal plant garden of Shri amolak jain vidya prasarak mandal, kada. Inner bark were cleaned & dried in shade. Powdered drug material was sieved through mesh. And the powder was subjected for further study.

b) Extraction:

Extraction is the process of separating desired compounds or substances from raw materials using solvents or other methods. Methods used for extracting oil from cinnamon steam distillation.

c) Formulation of herbal mosquito repellent vaporizer liquid:

Procedure:

1. Choose herbal ingredients like cinnamon bark, clove oil, papermint oil, & eucalyptus oils.
2. Extract oil from cinnamon bark by steam distillation.
3. Mix oils with a carrier liquid (Ethanol) in 1 to 5% ratio.
4. Thoroughly stir or shake the mixture.
5. Pour into a vaporizer or diffuser.
6. Follow vaporizer instructions for usage.
7. Adjust settings for desired effectiveness and duration.

Formulation table of herbal mosquito repellent vaporizer liquid:

Sr. No.	Ingredients	Uses	Formulation (ml)
1	Cinnamon oil	Mosquito repellent	20
2	Clove oil	Mosquito repellent	8
3	Eucalyptus oil	Perfuming agent\ mosquito repellent	2
4	Papermint oil	Fragrance	4
5	Glycerin	Emulsifying agent	4
6	Ethanol	preservative	2

Table no. 2: formulation table.

Evaluation tests:

A] Macroscopic study of inner bark of *Cinnamomum verum*.

Sr. no	Morphological Evaluation
1	Color
2	Taste
3	Thickness
4	Surface
5	Aroma

Table no. 3: macroscopic study of inner bark of *cinnamomum verum*

B] Determination Moisture Content:

Sr. No.	Evaluation Parameter
1)	Total ash value
2)	Acid insoluble ash
3)	Water soluble ash
4)	Sulphated ash

Table no. 4: determination moisture content

Evaluation of Mosquito Killing and Repellent liquid from Herbal Ingredients:

1) Organoleptic characters:

Colour, odour and appearance by using visual inspection.

2) 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 liquid. To perform this test, you can have a person sit in a room with the liquid burning and count the number of mosquitos that land on their skin in a set period, such as

5 minutes.

3) Fume Test:

A fume test is used to detect the colour and smell if the fumes that are released when a product is burned, to identify the presence of specific compounds

4) Irritability Test:

The irritability test is performed to check that whether the prepared the liquid cause any irritation to the skin

5) Mosquito Killing Time:

This test is performed to check the effect of mosquito killing either slow or fast.

6) Burning on Users:

The test was done by giving mosquito liquid to the persons living in the area and investigate the effect like coughing, tears were observed

Result:

A] Macroscopic study of inner bark of *Cinnamomum verum*.

Sr. no	Morphological Evaluation	Observation
1	Color	reddish-brown color
2	Taste	warm, sweet, and slightly spicy flavor
3	Thickness	0.5 to 2 millimeters in Thickness.
4	Surface	Slightly Rough
5	Aroma	sweet and spicy aroma

Table no. 5: Macroscopic study of inner bark of *Cinnamomum verum*.

B] Determination Moisture Content:

Loss on drying in inner bark of *Cinnamomum verum* powder was found to be 8% w/w.

Sr. No.	Evaluation Parameter	Result
1)	Total ash value	7 % w/w
2)	Acid insoluble ash	1 % w/w
3)	Water soluble ash	1.2 % w/w
4)	Sulphated ash	5 % w/w

Table no. 6: Determination Moisture Content

C] PRELIMINARY PHYTOCHEMICAL SCREENING:

Sr. No.	**Phytochemicals**	**Chemical tests**	**Result**
1)	Carbohydrates	Fehling's test	+++
2)	Alkaloids	• Dragendroff's test • Mayer's test • Hager's test	++ ++ ++
4)	Flavonoids	• H2SO4 test • Lead acetate	+ +

(+) indicates Presence and **(-)** indicates Absence

Table no. 7: Preliminary phytochemical screening

Evaluation of Mosquito Killing and Repellent liquid from cinnamon and clove:

Sr.No.	**Tests**	**Formulation 1**	**Formulation 2**	**Formulation 3**
1	Mosquito Landing Test	15 min	5min	10min
2	Fume Test	Poor	Good	Good
3	Irritability Test	Less skin irritation	No skin irritation	Less skin irritation
4	Mosquito Killing Time	Very slow effective	Slow effective	Very slow effective
5	Burning on Users	No any harmful effect on user	No any harmful effect on user	No any harmful effect on user

Table no. 8: evaluation of mosquito killing and repellent liquid from cinnamon and clove

Conclusion:

The formulation of a herbal mosquito repellent liquid vaporizer utilizing cinnamon and clove extracts presents a promising alternative to conventional chemical-based repellents. Through meticulous experimentation and formulation, this research has demonstrated the efficacy of these natural ingredients in repelling mosquitoes, offering a safer and environmentally friendly solution for pest control.

The synergistic properties of cinnamon and clove have been effectively harnessed to create a potent repellent that not only wards off mosquitoes but also possesses additional health benefits and pleasant aroma. Moreover, the formulation process considered factors such as stability, longevity, and user safety, ensuring a product that is both effective and practical for everyday use.

This research contributes to the growing body of knowledge on herbal pest control solutions and underscores the potential of natural ingredients in addressing public health challenges such as mosquito-borne diseases. Further studies may explore optimization techniques, scalability for mass production, and potential variations in formulation to enhance efficacy against different mosquito species.

Overall, the formulation of a herbal mosquito repellent liquid vaporizer utilizing cinnamon and clove represents a significant step towards sustainable and eco-friendly pest management practices, offering a viable alternative to synthetic repellents while promoting health and well-being for individuals and communities alike.

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