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Formulation and evaluation of Herbal Mosquito Repellent in two forms used in folklore practise

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ABSTRACT

Mosquito borne diseases including malaria, dengue, filariasis, and chikungunya cause serious health hazards across the world. Several mosquito repellents are currently in the market; however, most of these are not efficacious and eco-friendly. Recently, considerable research progress has been made to develop more pleasant, effective, and non-toxic to other species using herbal oils and formulations. Also, these herbal compositions are easily available and economic. Although, this existing herbal composition has been demonstrated to be effective and non-toxic to humans, they are more volatile and short lifespan of these compounds has necessitated further development of plant originated pesticides as alternative to chemical pesticides. In the current study, we have developed the various herbal formulations and showed that these formulations are effective mosquito repellents. The survey further showed that these repellents are pleasant with minimum allergic reactions.

Key words: Mosquito repellent, plant extract, herbal repellent, non-toxic, human health

INTRODUCTION

Mosquitoes are small flies that belong to the family culicidae. The mosquito is a Spanish word which mainly refers to "little fly".^[1] These are mainly invertebrates. About 3000 of mosquito's species transmit disease when compared to other creatures in the world. Both female and male mosquitos feed on the same kind of food. However, the female mosquitos are only responsible for the transmission of the pathogens. The mosquito may cause life threatening diseases such as Filariasis, Dengue fever, yellow fever, Chikungunya and

other arboviruses. They mainly transmit the diseases just by a bite on the skin and through its saliva that pathogens get injected into the host. Mosquitos mainly transmit diseases to more than 700 000 000 people annually and which results for the death 1 out of 17 is alive.^[2,3]

Hence, to overcome these problems mosquito repellents came into existence. Mosquito repellents are those which help to make surfaces unpleasant to mosquitos.^[4] At present repellents are available in various forms such as the coils, cones and vaporisers. Mainly, the herbal mosquito repellents show more efficacies when compared to other non-herbal repellents due to their non-toxic effects as well they are eco-friendly. After the disco very of DDT, the approach on the mosquito control is mainly based on synthetic organic insecticides.^[5] The 9 potential plants like Siam weed (*Eupatorium odoratum*), Greater galangal (*Alphinia galanga*), Turmeric (*Curcuma longa*), Neem (*Azadirachta indica*), Fingerroot (*Boesenbergia pandurata*), Siamese cassia (*Cassia siamea*), Cardamom (*Elettaria cardomomum*), Eucalyptus (*Eucalyptus citriodora*) and Citronella grass

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(*Cymbopogon nardus*) are the excellent mosquito repellents that are mainly used to make coils.^[6] The oils of Lemon grass, Citronella and clove show best repellent activity against the mosquitos.^[7] Mustard oils have also showed repellence against Aedes bites for longer duration.^[8] Hence, the mosquito repellents are the substances that protect the human beings from sting of mosquitos and there by promising us safety against them.

In this study we report novel and effective method of mosquito repellent product making using different plant extracts which protect from mosquito bites and purifies the air present in the house, eliminates diseases causing microbes.

AIM

To develop the effective and less toxic mosquito repellents using herbal compositions

OBJECTIVES

1. These plants can be used as a natural mosquito repellent
2. It can be used to repel mosquitoes present at home.
3. Purifies the air present in the house, kills diseases causing microbes.
4. Useful in various *Graha Bhadas*.

METHODS

This study used two different methods to make mosquito repellent

1. Mosquito repellent cones
2. Mosquito repellent solutions

Mosquito repellent cones*

Components	Quantity (in grams)
<i>Tulasi (Ocimum tenuiflorum)</i>	2.5
<i>Nirgundi (Vitex negundo)</i>	2.5
<i>Dronipushpi (Leucas cephalotus)</i>	2.5

<i>Agnimantha (Cluodendrum phlemoides)</i>	2.5
<i>Ashwashakotaka (Glycosmis pentaphylla)</i>	2.5
<i>Solle Gida (Euodia roxbergiana)</i>	2.5
<i>Hyptis suaveolens</i>	2
Cow Dung Ash	2
Charcoal powder	2
Gum acacia	2

*Ingredient for one cone

Detailed procedure

Mosquito repellent cones were made using *Tulasi (Ocimum tenuiflorum)*, *Nirgundi (Vitex negundo)*, *Dronipushpi (Leucas cephalotus)*, *Agnimantha (Cluodendrum phlemoides)*, *Ashwashakotaka (Glycosmis pentaphylla)*, *Solle Gida (Euodia roxbergiana)*, *Hyptis suaveolens*, cow dung ash, charcoal powder and gum acacia. The plants are dried under shadow [fig 1 (a)], powdered into fine particles. Later gum acacia is mixed with water and this along with cow dung ash and charcoal powder is mixed with dry powder of leaves and cones are prepared using "Mould" (fig 1). Repellent activity is checked using human volunteers.

Mosquito repellent solution

Method 1 (distillation):

Component	Quantity (in grams)
<i>Tulasi (Ocimum tenuiflorum)</i>	6.7
<i>Nirgundi (Vitex negundo)</i>	6.7
<i>Dronipushpi (Leucas cephalotus)</i>	6.7
<i>Ashwashakotaka (Glycosmis pentaphylla)</i>	6.7
<i>Solle Gida (Euodia roxbergiana)</i>	6.7
<i>Hyptis suaveolens</i>	3

Bhustrana	9.7
Water	600 ml

Detailed procedure

Distillation of *Tulasi (Ocimum tenuiflorum)*, *Nirgundi (Vitex negundo)*, *Dronipushpi (Leucas cephalotus)*, *Ashwashakotaka (Glycosmis pentaphylla)*, *Solle Gida (Euodia roxburghiana)*, and *Bhustrana (Cymbopogon citratus)* is performed using a distillation apparatus, and the extracted solution is then placed in a mosquito repellent vaporizer [fig 2 (a)]. To create a pleasant scent, 2-3 drops of scented oil are added to the vaporizer. Once the vaporizer is connected to an electric source, the duration of the repellent activity of the solution is tested using a human volunteer.

Method 2 (cold extract in ethanol)

Component	Quantity (in grams)
<i>Tulasi (Ocimum tenuiflorum)</i>	1.5
<i>Nirgundi (Vitex negundo)</i>	1.5
<i>Dronipushpi (Leucas cephalotus)</i>	1.5
<i>Ashwashakotaka (Glycosmis pentaphylla)</i>	1.5
<i>Solle Gida (Euodia roxburghiana)</i>	1.5
<i>Hyptis suaveolens</i>	1.5
<i>Bhustrana</i>	1.5
Ethanol	200 ml

Detailed procedure

Tulasi (Ocimum tenuiflorum), *Nirgundi (Vitex negundo)*, *Dronipushpi (Leucas cephalotus)*, *Ashwashakotaka (Glycosmis pentaphylla)*, *Solle Gida (Euodia roxburghiana)*, and *Bhustrana (Cymbopogon citratus)* powders were taken as mentioned above. They were soaked in ethanol for 48 hours in a flask and shaken every 30 minutes [fig 2 (b)]. After 48 hours, the mixture was filtered and filled into vaporizers. 2-3 drops of scented oil were added to the vaporizer to

provide a pleasant smell. The vaporizer was then connected to an electrical source, and the duration of repellent activity of the solution was checked using human volunteer.

OBSERVATION AND RESULT

In situ

Exp no 1:

1. This was done to test the repellent cones
2. A mosquito repellent experiment box was prepared using 2 cardboard boxes
3. Those 2 boxes were connected using a plastic pipe.
4. A hole was kept in the right side of the box 1 to keep the cone and to let the mosquitoes inside the box.
5. A repellent cone was lighted and kept inside the box with a glass slide below it.
6. After 2 min the glass slide broke due to the heat to the cone and to avoid burning of cardboard this experiment was discontinued.

Exp no 2:

1. Same box was used but this time small metal plate was kept below.
2. The experiment was continued till the cone was burning.

Ex situ

Exp no 1:

The repellent activity of the mosquito repellent solution was checked by giving the vaporizers to the human volunteers.

OBSERVATION

In situ

- Time required for a cone to burn - 30 min
- Number of mosquitoes let inside the box - 9
- Number of mosquitoes ran from box 1 to box 2 - 5 (in 5min)
- Number of mosquitoes died - 3 (after 15 min)

- Effects on health - none
- Irritation - None

Ex situ

- Odour - pleasant
- Repellent action observed
- Irritation - None

RESULT

Studies have shown that herbal cone and liquid mosquito repellents have excellent mosquito cidal and repellent properties against mosquitoes. These herbal repellents have proven to be effective in keeping mosquitoes at bay, and have also shown a significant positive effect on human health, with no negative side effects. This is in contrast to chemical mosquito repellents, which can have harmful side effects and pose a risk to human health. The use of herbal mosquito repellents not only protects against mosquito-borne diseases, but also offers a safe and natural alternative to traditional chemical repellents. Therefore, it can be concluded that the use of herbal mosquito repellents is a viable and beneficial option for individuals seeking effective and safe protection against mosquitoes.



Figure 1: Few representative images showing the- a) dried plants extracts, b) powdered dried drugs, c) repellent cones, d) burnt cone and e) ash



Figure 2: Few representative images showing the - a) Distillation apparatus, b) sample kept for cold extract and c) vaporizers filled with cold extract and distilled solutions.

CONCLUSION

The effectiveness of herbal mosquito repellents has been studied in recent years, and the results have been encouraging. Specifically, two forms of herbal mosquito repellent have been found to have good repellent action against mosquitoes. In addition, the use of these herbal repellents has also been shown to have a significant positive effect on human health, with no negative side effects reported. As a result, there is a growing interest in using herbal mosquito repellents as an alternative to chemical repellents. Given their effectiveness and positive impact on human health, herbal repellents offer a promising solution for those looking to protect themselves from mosquito-borne diseases without relying on harmful chemicals.

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