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HERBAL MOSQUITO REPELLENT: A REVIEW

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ABSTRACT

A mosquito repellent is a substance applied to skin, clothing, or other surfaces which discourages mosquitoes from landing on that surface. Many medicinal herbs and their essential oil has been reported to have many pharmacological activities and one of which is their property to repel the mosquitoes. Mosquitoes are small, midge like flies that belongs to the family Culicidae which transmit extremely harmful diseases and rendering it to the deadliest animal family in the world. The main objective of this review to study mechanism of mosquito repellent need of herbal mosquito repellent and herbal plants and their essential oils that are used as mosquito repellent.

KEYWORDS: Herbal mosquito repellent, essential oils, etc.

INTRODUCTION

Diseases transmitted by mosquitoes destroy more human lives than the combined casualties of war, terrorism and gun violence. Dengue is an emerging viral disease transmitted by the yellow fever mosquito [Aedes *(Stegomyia aegypti)*] with 100–400 million infections a year. Severe dengue is a leading cause of serious illness and death among children in some Asian and Latin American countries. Dengue is now endemic in more than 100 countries and about half of the world population is at risk. Zika became notorious not only because of its explosive outbreak in Latin America but also for causing a congenital Zika syndrome. There are also many other mosquito-borne diseases, including chikungunya, West Nile, and Mayaro.[1,2,3,4]

Need of Mosquito repellent

The first line of defense against infection by mosquito to people living in or traveling to endemic areas is to use mosquito repellents. With the growing number of emerging mosquito borne diseases, it is not surprising that the consumption of repellents is in an upward trend. Most commercial repellents are produced by using chemical components such as N, N-diethyl-metatoluamide (DEET), Allethrin, N, N-diethyl mendelic acid amide, and Dimethyl phthalate. It has been identified that these chemical repellents are not safe for public health and should be used with caution because of their detrimental impacts on synthetic fabric and plastic as well as toxic reactions, such as allergy, dermatitis, and cardiovascular and neurological side effects which have been reported generally after misapplication. The frequent use of synthetic repellents with chemical origin for mosquito control has disturbed natural ecosystems and resulted in the development of resistance to in mosquito populations. Accordingly, the idea of using herbal mosquito repellent products as an alternative to develop new eco-friendly repellents could be a best solution to scale back the undesirable effects on environment and human health.[5,6,7,8]

Mechanism of mosquito repellents

Mosquitoes usually use the warm and humid convection rising from the human body as a mode for contacting humans by sensing an increase in atmospheric carbon dioxide concentrations.

The action of mosquito repellent agents can be broadly divided into two types.[9,10,11]

1. Olfactory mode

In Olfactory mode which is also called as transpiration repellence, humidity-sensing holes of mosquitoes which helps the mosquitoes in locating the living organisms are blocked hence they cannot locate humans.

2. Tactile mode

The tactile mode action is also called as direct-contact repellency which drives the insects away from the surface before they can suck blood and tactile mode is based on the action of repellent substances on the mosquito's nervous system which causes them to enter in a confused state and resist their behaviour at sub-lethal/mortal/toxic doses, before knockdown due to their contact with fabric surface.

Herbal plant used as a mosquito repellent

1. Rosmerry Plant[12]

Biological Source: It is fresh leaves obtained from *Salvia rosmarinus.*

Family: Lamiaceae.

Fig. 1: Rosmerry plant.

One of the best plants that keep mosquitoes away is rosemary plant shown in fig 1.[13] Rosemary is a fragrant plant and their woody scent you can smell in a rosemary leaf is due to a molecule called pinene actually what keeps the mosquitoes off from your home. They work best in warm and dry temperatures and can be effectively grown in small vases. The structure of active constituents that act as a mosquito repellent is shown in fig 2.[14]

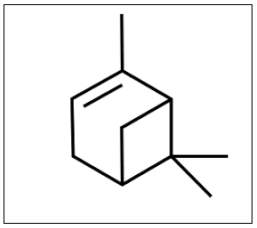

Fig.2: Structure of Pinene.

2. Eucalyptus[15]

Biological Source: It is a fresh leaves obtained from *Eucalyptus globulus.*

Family: Myrtaceae.

Fig. 5: Eucalyptus.

Eucalyptus is also one of the best mosquito repellent plant shown in fig 5. [16] P-Menthane-3, 8-diol (PMD) is an active constituent found in eucalyptus oil and it has been registered with EPA as a mosquito repellent since 2000. When USDA researchers tested the success of P-Menthane-3, 8-diol as a mosquito repellent, they found that it provided protection from bites for about 7 hours. The structure of active constituents that act as a mosquito repellent is shown in fig 6.[17]

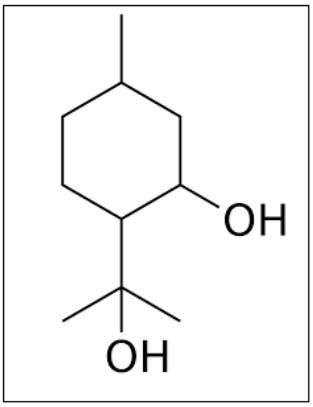

Fig 6: Structure of PMD.

3. Lemongrass[12]

Biological Source: It is a fresh leaves obtained from *Cymbopogon citratus.*

Family: *Poaceae.*

Fig. 3: Lemongrass.

Another amazing mosquito repellent is the Lemon Grass shown in fig 3.[18] It contains citronella which is a natural oil that contains citronellal which repels the mosquito. The structure of active constituents that act as a mosquito repellent is shown in fig 4.[19]

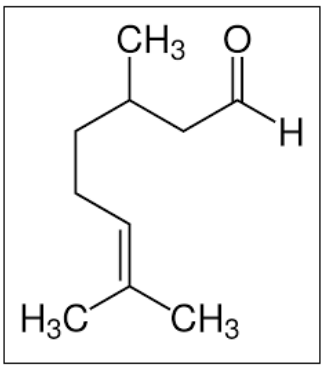

Fig. 4: Structure of citronellal.

4. Neem[12]

Biological Source: It is a fresh or dried leaves, seed and fruit obtained from *Azadirachta indica.*

Family: Meliaceae.

Fig.6: Neem.

The neem has many medicinal activity and one of them is repellent activity that means neem is also called repellent plant shown in fig 7.[20] The neem contains neem oil which has main constituent is Azadirachtin and this azadirachtin is mainly responsible for repellent activity. The structure of active constituents that act as a mosquito repellent is shown in fig 8.[21]

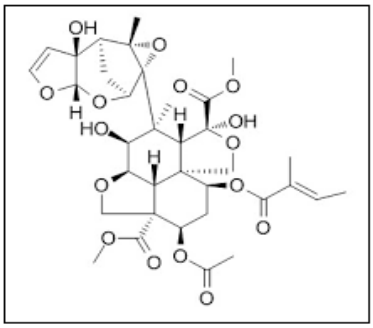

Fig.8: Structure of Azadirachtin.

5. Catnip[12]

Biological Source: It is leafy green plant known as Nepeta cataria.

Family: Lamiaceae.

Fig 9: Catnip.

Cats love this plant hence it is named as catnip shown in Fig 9.[22] Catnip is also a great mosquito repellent. Nepetalactone is one of the primary ingredients in Catnip, which was seen as much more effective than even DEET as indicated by many researchers. Catnip is likewise a decent non-toxic substitute to generally used synthetic sprays. The structure of active constituents that act as a mosquito repellent is shown in fig 10.[23]

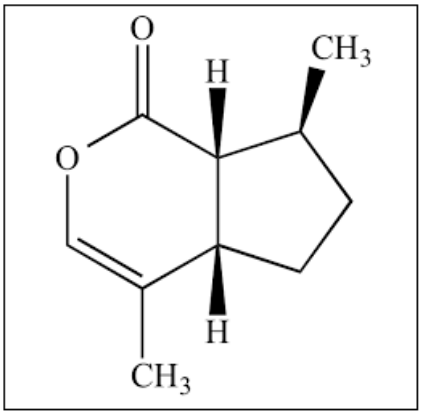

Fig.10: Structure of Nepetalactone.

6. Lavender[24]

Biological Source: It is pleasant smelling flowering plant known as *Lavandula angustifolia.*

Family: Lamiaceae.

Fig.11: Lavender.

This pleasant-smelling plant can calm your mind after a long day and drive mosquitoes far away shown in Fig 11.[25] This pleasant smell due to the high percentage of esters mainly linayl acetate. The structure of active constituents that act as a mosquito repellent is shown in fig 12.[26]

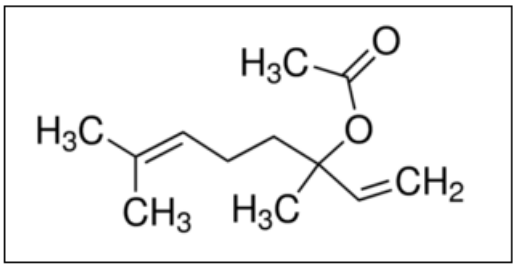

Fig.12: Structure of Linayl acetate.

7. Floss Flower[24]

Fig 13: Floss flower.

These fuzzy flowers are a great visual addition to your flower bed or as an edging plant. Floss flowers come in blue, pink white and purple and also easily complement any bouquet shown in Fig 13.[27] Floss flowers contain a chemical called coumarin that is used in common mosquito repellents. The structure of active constituents that act as a mosquito repellent is shown in fig 14.[28]

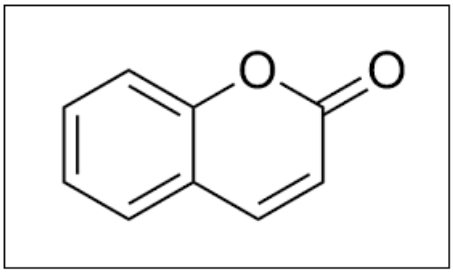

Fig. 14: Structure of coumarin.

CONCLUSION

From this review we studied in detail about mechanism of mosquito repellent need of herbal mosquito repellent and herbal plants and their essential oils that are used as mosquito repellent and concluded that there is presence of many herbal plants which act as mosquito repellents. From these medicinal plants there will be a promising role in the development of future commercial repellent. This review indicates on this topic few work has done and there is need of research to be carried out on the bioactive compounds present in the particular plants which have a potential against mosquito as a solution of the harmful effects of synthetic mosquito repellent, including lack of selectivity, impact on the environment and the emergence and development of resistance.

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