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Preparation and Applications of Anti-Mosquito Herbal Dhoopwati by using Mosquito Repellent Plants

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Abstract
Herbal dhoop is natural product which is composed of natural mosquito repellent plant parts. It is made from unique blend of plant extracts and aromatic oils which repels the mosquito or insects away and it is safe, non -toxic, eco-friendly.In the present study the essential oils and plants extract were tested at different concentrations with handmade mosquito stick at the corner of the room where large number of mosquitoes are present. The results revealed that the different combinations of herbal plants showmosquito repellent activities. Camphor, lemon grass, Neem, Tulsi, and Vitexnirgundis how highest mosquito repellences and no irritability was reported on the skin. Hence it is safe and eco-friendly in use.

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1. INTRODUCTION

There are 17,500 Aromatic plants species among higher plants and approximately 3,000 essential oils are known out of which 300 are commercially important for pharmaceutical, cosmetics and perfume industries apart from pesticides or repellent potential. In nature essential oils play an important role in the protection of the plants as antibacterial, antiviral, antifungal, insecticide and also against herbivorous by reducing their appetite for such plants (Rahuman et al., 2007). Mosquitoes borne diseases create major human health problems such like diseases are fever, dengue, hey fever, kala azar and chikengunia (Service, 1993). These serious diseases increasing the high rate of reproduction and development of mosquitoes. Synthetic pesticide or repellents have been used to resistance growth of mosquitoes and killing the adult mosquito's larva (Specos et al., 2010). Synthetic chemical repellents applied for controlling to mosquitoes, but chemicals are dangerous for human health as well as animals due to their toxic nature. So researcher thought about toxicity and exploiting natural products which are not toxic and without side effect control the larval mosquitoes like as chemical repellents (Trivedi et al., 2018). According to WHO recent report main insecticides are used against mosquitoes in Americas are organophosphates, pyrethroids and DEET (N, N diethyl-m-toluamide). These chemicals have less side effects. Pyerthroids commonly used as kill and control of adult mosquito larva. Many plants extract identified and applied against mosquitoes, these are like neem oil, citronella oil which are lees effective against DEET.

Essential oils are natural, volatile complex compound which contain strong odour and are prepare by aromatic plants as a secondary metabolites which play a significant role to high anti- repellent activity (Madhumathy et al. 2007). When repellent applied on skin they contain DEET like repellent, help to evaporates and block to lactic acid receptors, destroying upwind flight and mosquito lost connection with host (Hallem et al., 2004; Sah et al., 2010). Natural plants namely as Turmeric (*Curcuma longa*), (*Azadirachta indica*), Cardamom (*Elettaria cardamomum*) , Siamese cassia (*Cassia siamea)*, Citronella grass *(Cymbopogon nardus)*, Eucalyptus (*Eucalyptus citriodora*) and Siam weed (*Eupatorium odoratum*), Galangale (*Alpinia galanga)* have high degree of repelleny against mosquitoes are recommended as new active ingredients for inclusion in mosquito coil formulation(Trivedi et al., 2018). These plants contain bioactive compounds which act as repellents are alkaloid, trepenoids, phenolic, proteinase inhibitors and growth regulators which are functioning as a defence against phytophagous insects (Patil et al., 2012) Table 1.

Table 1: Herbal plants shows their properties against mosquitoes

Sr.No.	Botanical Name	Common Name	Properties	Protection against Mosquito	References
1.	*Azadirachta indica*	*Neem*	Antifungal, Antiviral, Antibacterial activity	Yellow fever mosquito	Duaet al., (2009)
2.	*Curcuma longa*	Turmeric	Antifungal, Antiviral, Antibacterial activity	Yellow fever mosquito	de Souza Tavares et al., (2016)
3.	*Elettaria cardamomum*	Cardamom	Antimalarial	Yellow fever mosquitoes	Mona (2020)
4.	*Eucalyptus citriodora*	Eucalyptus	Antiviral	Filarial mosquitoes	Mandal(2011)
5.	*Cymbopogon nardus*	Citronella grass	Antifungal	Southern house mosquito.	Soonwera and Phasomkusolsil (2015)
6.	*Cassia siamea*	Siamese cassia	Antimalarial	Yellow fever mosquito,	Jiraungkoorskul and Jiraungkoorskul(2015).
7.	*Eupatorium odoratum*	Siam weed	Anti-infilamentry, Antifungal	Yellow fever mosquito, whitefly	Ezena(2015)
8.	*Ocimum basilicum*	Basil	Antifungal	Yellow fever mosquito	Maia and Moore(2011)
9.	*Nepta cataria*	Catnip	Antimicrobial, antifungal	yellow fever mosquitoes	Peterson(2011)

2. MATERIAL METHODS

Collection of mosquito repellent natural plants. The raw materials for the production of the herbal Mosquito repellent stick were , Bark powder, Camphor, Gum Acasia , vitex , lemon grass, Basil (*Ocimum basilicum)*, Neem (*Azadirachta indica)*, Eucalyptus (*Eucalyptus citriodora*) and essential oils like Tulsi oil, Neem oil . First of all, for the stick Preparation, collected the plant material or plant parts from the around or botanical garden at MMDU, Mullana, Ambala, Haryana campus. Collected plant parts taken into mortar pestle and crushed them into a fine paste. After this crushed material mix for about 45 minutes. So that the remaining quantities of water is completely remove. After this we added binders which collect all the mixture or materials together so that all ingredients bind together. As a binder gum *Acasia* is added into the mixture and some essential oils like Neem oil, clove oil are also added. So that, all mixture looks so sticky. Now after, crushing, drying and adding the binders we make the Dhoopwati by rolling all this prepared mixture together.

3. RESULT AND DISCUSSION

In this investigation, the attempts have been made here to prepare mosquito stick (Dhoopwati) by using plant parts along with herbal mosquito repellent products (Table 2). Essential oils were tested each at different concentrations on the mosquito stick against mosquitoes, at the corner of the room where large number of mosquitoes are present. The figure 1 showed the primary observations of the formulations such as burning time, repellency activity. The repellency activity by the stick or dhoop to the mosquitoes shown successful results and it explains that natural insecticidal preparations are always effective than synthetic or chemical repellents. During the burning of herbal mosquito stick dhoop, it was shown that up to 80% of the mosquito number was reduced. The samples formulations D-1 which included, Eucalyptus leaf, Camphor, Clove. D-2 which include Neem, Lemongrass, Clove shown 65%. D-3 include Camphor,Lemongrass,Clove shown 72%, D-4 Neem, lemongrass and Tulsi are shown 70% results. D-5 included Eucalyptus leaf, lemongrass, Tulsi, Neem and Camphor shown 80% repellency activity. Yap et al., 1990 studied that Neem is Mosquito repellent for up to 12 hours. Therefore, the use of herbal mosquito repellent plant parts with oils for the effective control of mosquitoes is an alternative pest control method for minimizing the toxic effect of some pesticides compounds on the environment. Essential oils of many plants showed mosquito repellent activity and control mosquito vector borne diseases (Trivedi et al., 2018). Lemongrass oil showed good repellent activity against mosquito (Tripathi et al.,2004).

Table 2: Sample and ingredients of herbal anti-mosquito stick (Dhoopwati)

Sr.No	Sample No	Ingredients
1.	D-1 Dhoop	Eucalyptus leaf + Camphor + Clove
2.	D-2 Dhoop	Neem +Lemongrass + Clove
3.	D-3 Dhoop	Camphor + Lemongrass + Clove
4.	D-4 Dhoop	Neem + lemongrass + Tulsi
5.	D-5 Dhoop	Eucalyptus leaf + lemongrass+ Tulsi + Neem + Camphor

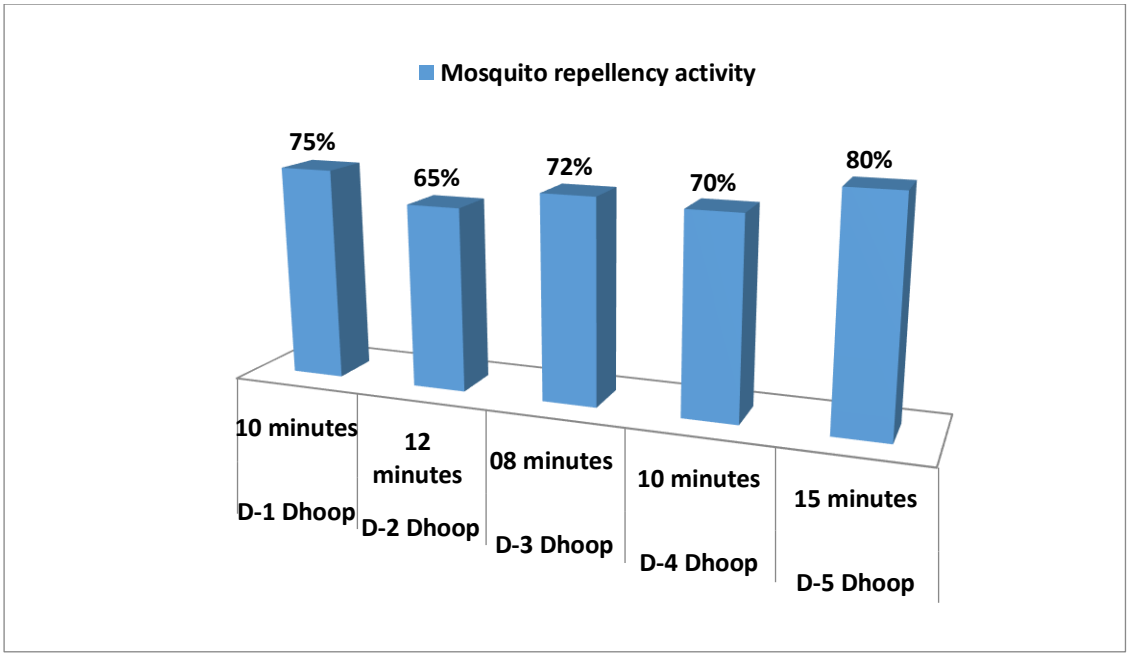

Figure 1: Primary Observations of Herbal Mosquito sticks (D1-D5) showing repellency activity against Mosquitoes

CONCLUSION

The present study shows that all the natural mosquito repellent plants provide approximately equally protection against mosquitoes. These could help in reducing the harmful effects of synthetic or chemical mosquito repellents on Human Health. Moreover, these dhoopwati or sticks is safe, eco-friendly, cheap, easy to use and has Maximum repellence against the mosquitoes. In addition, these home- made herbal repellents are less harmful to our health than the coils available in the market. It can be prepared at home as it does not require any heavy infrastructure and investment as compared to market coils and mats. It is evident from the present study that lemon grass, neem, tulsi and camphor exhibit significant anti-mosquito repellent activities activity with combination of clove, neem and tulsi.

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