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AN OVERVIEW OF THE EFFECTIVENESS OF HERBAL PLANTS IN REPELLING MOSQUITOES: ESSENTIAL OILS

Anand Singh*, Aditya Pratap Mall and Prince Kumar Verma

Department of Pharmacy, Rameshwaram Institute of Technology and Management, Lucknow, UttarPradesh, India.

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***Corresponding Author**
Anand Singh
Department of Pharmacy, Rameshwaram Institute of Technology and Management, Lucknow, UttarPradesh, India.

ABSTRACT

Mosquitoes, with over several species, are common insects found around the globe. They are known to spread disease such as dengue, malaria, yellow fever and filarial infection. Mosquito – borne disease pose a significant public health challenge in tropical areas, particularly in Africa and Asia. Theese disease spread through mosquito bites, making it crucial to prevent these bites to control their impact. One effective and safe approach is use to mosquito repellents derived from medicinal plant. Using mosquito repellent is a crucial to prevent bites from these pests. Repellents are available in various forms, including synthetic chemicals, essential oils, natural plant extract. While chemical repellents provide strong protection, they can also be harmfull. DEET (N, N-Diethyl-3methylbenzamide) is the most widely used chemical repellents; it works quickly but poses certain risks. For a safer alternative, one can opt for essential oils, which not only repel mosquitos but also offer health benefits. The essential oils were extracted by Hydrodistillation method at 50 with an all glass Clevenger apparatus. After extraction, they were kept in the refrigerator at 4 until further studies could be conducted. Oils from lavender, basil, pine, peppermint, lemongrass, lemon, eucalyptus, camphor and neem are effective in keeping mosquitoes at bay while being kind to the skin. Plant based repellents are free of chemicals and tend to be safer and more beneficial overall. Numerous option exist from plant based mosquito repellents, and many effective solutions can be easily created at home using common kitchen ingreadients like garlic, lavender, cloves, cinnamon, bay of leaves, neem are use to make chemical free, safe and efficient mosquito repellents. The present study demonstrates the potential for using essential oils from medicinal plant as

mosquito repellent.

KEYWORDS: *Malaria, Plant, Essential oil, DEET, Repellents, Mosquito, Natural.*

INTRODUCTION

Mosquitoes, with over 3500 several species from the Anopheles, Culex and Aedes genera transmit pathogens that cause disease such as Malaria, Filariasis, Japanese Encephalitis, Dengue, Fever and Yellow fever. One effective method to control these mosquito borne illness is to interrupt the transmission of disease by either eliminating the mosquito or preventing them from biting people. Chemical repellent often have negative effect. Many synthetic chemicals have raised concerns due to their cancer causing potential, leading to decline their use. Scientist are now exploring new repellents and insecticides derived from natural source that do not pose cancer risks. These natural herbal insecticides are highly effective and have minimal toxicity to humans, animals and the environment while also providing pest control. Although DEET (N, N-diethyl-3-methylbenzamide) is currently the mostwidely used mosquito repellent, it offer excellent protection against mosquito.

The effort to make human less appealing to mosquitoes has driven years of global research into mosquito behavior and control. Despite these efforts, mosquitoes spread diseases to over 700 million people each year, causing the death of approximately 1 in every 17 indivisuals alive today. Malaria, which comes from a protozoan carried by mosquitoes, leads to around 3 million deaths each year, according to the World Health Organization (WHO). In India alone, more than 1.75 millon malaria cases have been reported, resulting in over 1000 deaths annually. Mosquitoes also spread various arboviruses that cause yellow fever, dengue fever, epidemic polyarthritis and several types of encephalitis, some of which are present in India.

Heat sensors

Mosquitoes has ability to detect heat, allowing them to swiftly target warm blooded animal once they are in proximity.

Chemical sensors

Studies that indicate that mosquitoes can sense propen-3-ol, carbon dioxide and lactic acid from several yards away. Humans and animals release that substance when they breath or sweat. This explains why indivisuals who sweat more tend to attract more mosquitoes, while thosewho sweat less receive fewer bites.

Mosquito repellenthistory

Throughout the history, various plants oils, smokes, tars and other substance have been used to repel insects, either by killing them or keeping them away. Before World War II, there were only four main insect repellents: dimethyl phthalate, Indalone, Rutgers and Citronella oil, which was commonly usedto treat head lice.

In 1956, the first DEET based product was introduced. Today DEET remains the most popular mosquitorepellent. Although it is generally viewed as safe, some users have reported side effect, including reduced heart rate, urticaria syndrome, allergic reaction, encephalopathy in children, as well as hypotension and slower heart rate.

Working of repellent

Insect repellents creates a barrier that mosquito and other pests find unapealling. These product include active ingredients that either disguise scents that attract insect or release odors that repel them. When aapplied to skin or clothing, repellents help keep insect at bay, which lowers the chance of getting bitten. Various products have different formulas, but their primary purpose remains the same: To protect against unwanted insect encounters.

Fig. 1: Mosquito.

Methods for controlling mosquitoes

There are many ways to control mosquitoes including-

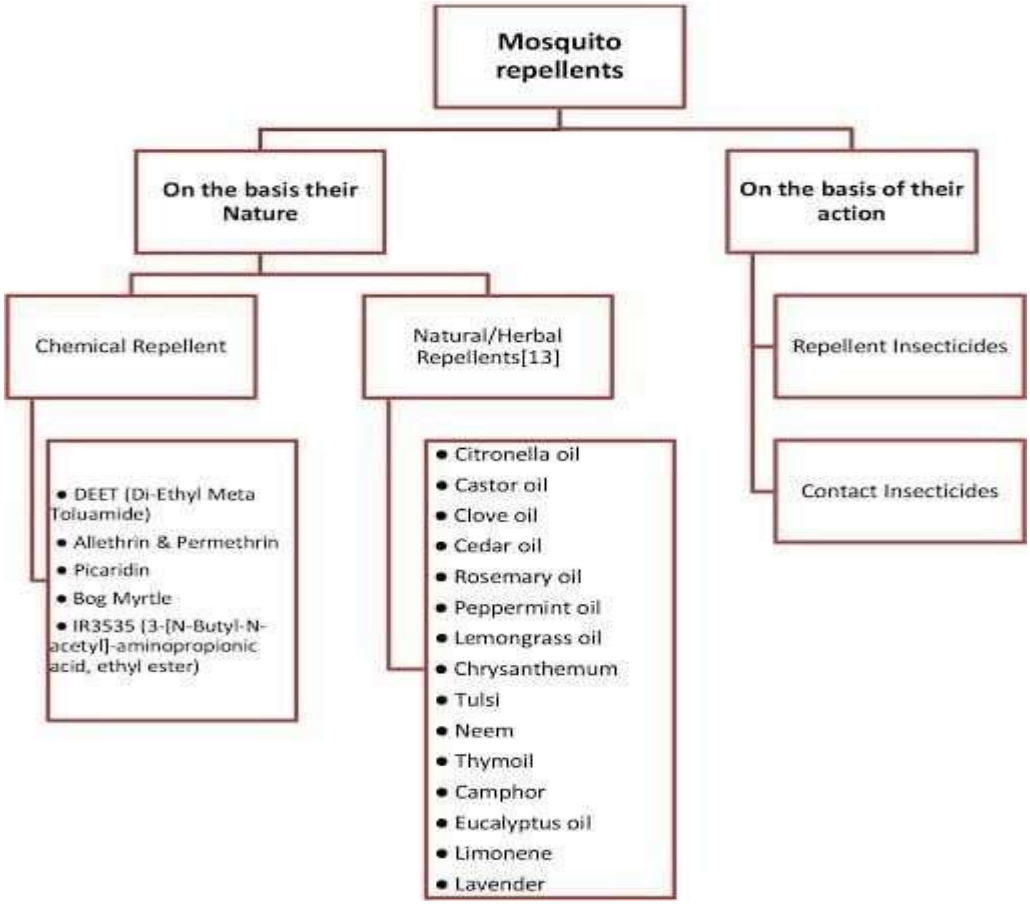
Eliminate breeding grounds

Mosquitoes breed in still water, so one effective way to lower their numbers is by removing or altering these water sources. To do this, make sure to empty and refresh the water in bird baths, fountains andtrays under potted plants at least once a week.

Use chemicals

Insecticides, specially adulticides, can effectively lower the population of adult mosquitoes in given areas. These adulticides can be dispersed using ultra low volume sprays or fogging techniques to targetmosquitoes in flight.

Classification of mosquito repellent



Need of herbal mosquito repellent

Researchers, including Tenenbein, along with data from poison control centers, have identified only small number of cases involving dermatitis, allergic reaction and cardiovascular issue, such as seizures, fallowing the use or ingestion of high concentration DEET product in both children and adults. despite the common use of DEET containing items, additional health concern have been documented, including tremors, slurred speech, coma and even fatalities. These products are an alternative to synthetic mosquito repellents that often contain chemical such as DEET which can be harmful to human and the environment. Herbal mosquito repellent is a safe and effective way to protect yourself from mosquito bites and reduce the risk of mosquito borne disease.

Herb and Plant with mosquito repellent properties

Eucalyptus [Eucalyptus globulus]

Eucalyptus globulus, often referred to as southern blue gum or blue gum, is a flowering part belonging to the Myrtaceae family. This tall, evergreen tree is native to southeastern Australia. It features mostly smooth bark and juvenile leaves that have whitish, waxy underside. The adult leaves are glossy green and lance shaped. Its flower buds can be glaucous and ribbed, present three to seven in the leaf axils.

Eucalyptus oil functions effectively as a natural insect repellent, offering defense against mosquito andvarious harmful arthropods, while also exhibiting antifeedant properties against herbivorous pests.

According to Yang et al. (2004), essential oils derived from E. globulus, particularly its primary monoterpene 1,8-cineole or eucalyptol, demonstrated toxicity towards human head lice, Pediculushumanus capitis.

Fig. 2: Eucalyptus [Eucayptus globulus].

Latanta [Latanta camara l.]

Lantana camara is a flowering plant belonging to the verbena family, originally originally found to the topical regions of the America. The species is highly adaptable, thriving in various ecosystem. Once it isintroduced to a new area, it can spread quickly.

Numerous pharmacological studies have highlighted the medicinal benefit of L. camara demonstrate strong larvicidal properties, while the flowers are known for their mosquito repellent effects. Previousresearch have documented various traditional method employed by tribal communities in the Amarkantak region to deter insect. Triterpenoids, Oleanonic acid, Lantadene A, Lantadene B, Lantanilic acid and Acerogenin are the primary phytochemical substance found in the latana.

Fig. 3: Latanta.

Turmeric [Curcuma longa]

Turmeric is a common species that comes from the root of Curcuma longa and family Zingiberaceae. It contains a chemical called curcumin, which might reduce swelling. Turmeric has a powerful scent and contains curcumin, which make it effective in repelling mosquito.

Three studies investigated the effectiveness of turmeric as a repellent. Auysawasdi et al. applied turmeric essential oil at concentration of 5%, 10%, 15%, 20% and 25% to An. dirus. Each concentration showed a dose-dependent response, providing complete repellency for durations of 4 to 8 hours, depending upon concentration used. Additional research indicate that turmeric oil can repel An. dirus for up to 6 hours and An. minimus for 1 hour.

Fig. 4: Turmeric (Curcuma longa).

Peppermint [Mentha piperita]

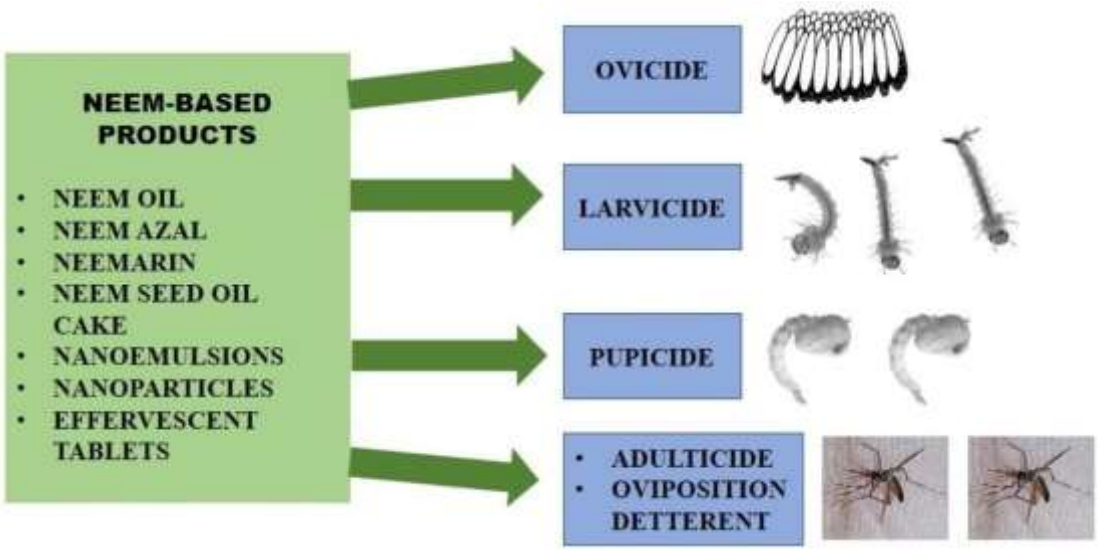
Peppermint (Mentha piperita) is a hybrid species resulting from the crossing of watermint and spearmint and family Lamiaceae. Originally from Europe and Middle East, this plant is now grow in the various part of the world, it can also found in its natural habitat alongside its parent plant. The peppermint have high menthol content, some other chemical constituents like menthone, carboxyl ester, menthyl acetate menthofuron etc.

Mentha piperita can be used as a natural mosquito repellent. It contain menthol, which can repel the mosquitoes and cool the skin. Three studies examined the impact of peppermint on Anopheles mosquitoes. A field trial by Ansari and colleagues found that 1 ml of undiluted peppermint oil effectively repels Anopheles annularis, An. culicifacies, and Anopheles subpictus for duration of 11 hours, 9.6 hours, and 7.3 hours, respectively, achieving repellency rates of 100%, 92.3 % and 80.1%. In another study, 20% peppermint oil solution demonstrated a 57% repellency rate and provided complete protection for 6.5 hours against An stephensi.

Fig. 5: Peppermint [Mentha piperita].

Neem [Azadirachta indica]

Azadirachta indica, widely known as neem or indica lilac is a tree belonging to the meliaceae family, which includes the mahogany. It is one of two species in the Azadirachta genus. Neem is originally from Indian subcontinent and certain region of South East Asia but has adopted and cultivated worldwide in tropical and subtropical climates. The trees fruits and seeds are the source of neem oil.



Neem oil serves as an effective natural mosquito repellent. It can be applied directly to exposed skin, sprayed in living areas, or mixed with water to target mosquito breeding sites. Two studies examined the repellency of neem oil against various Anopheles species. In a field trail by Amer et al., a 20 % Neem oil concentration exhibited a mean repellency of 71 %, providing a complete protection for threehour against An. arabiensis. Conversely, Seyoum et al. concluded that neem extract was not affective against An. gambiae.

Fig. 6: Neem.

Lemongrass [Cymbopogon citrats l.]

Lemongrass leaves possess an essential oil primarily made up of citral, which is also the main component in lemon peel, giving them a lemon like aroma. Additionally, lemongrass leaves rich in triterpenoids, including compound such as terpineol, dipentene, limonene, α-terpineol, citronellol,methyl heptenone, geraniol, nerol and farnesol.

Fig. 7: Lemmongrass.

Catnip [Nepeta cataria]

Catnip is a perennial herb from the mint family, Labiatae, found across Central Europe, Central Asia and the Iranian plateaus. A study by Amer et al. demonstrated that a 20% oil solution of catnip provided complete protection against Anopheles stephensi for 8 hours, highlighting its effectiveness in repelling in these mosquito. In contrast, research by Birkett et

al. in Kenya showed that the repellent properties of catnip vary based on concentration: solution of 0.01 mg, 0.1mg, and 1 mg yielded repellency rates of 17%, 97% and 100% respectively against Anopheles gambiae.

Fig. 8: Catnip (Nepeta cataria).

COCLUSION

This study`s findings indicate that certain plant effectively repel mosquitoes , particularly Anopheles spp.Although some plants have shown these repellent properties , there has been a limited development of natural products over past two decades despite ongoing research for few natural repellent . This review aims to inform entomologists and other professional studying mosquito borne disease about the potential applications of plant based repellent in disease management.

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