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A REVIEW: HERBAL MOSQUITO REPELLENT PLANT

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ABSTRACT

Herbal plants, which contain a range of physiologically active compounds that are advantageous for improving one's quality of life, are the main source of both modern and conventional herbal therapy for sickness prevention. As an environmentally friendly alternative to repellents made of chemicals.The candle includes a blend of natural essential oils, including lemon, lavender, and rosemary, which are known for their capacity to ward off insects, together with an appropriate wax base for optimal burning. The number of diseases caused by mosquitoes is rising daily. Among the diseases that mosquitoes commonly cause are chicken-gunya, dengue, zika virus, filariasis, malaria, and yellow fever.The produced candle was examined in the lab at room temperature. The produced candle is evaluated for organoleptic characteristics, including colour, texture, and fragrance, as well as for flammability and irritability. Examine. Herbal mosquito repellent candles are beneficial for both human health and insects. The formulation method involved determining the ideal concentrations for each essential oil in order to maximise efficacy and guarantee safety for indoor use. The effectiveness of the candles as a mosquito deterrent was evaluated by measuring its duration and effectiveness through controlled field testing. Physical characteristics including stability, scent throw, and burn time were also evaluated. The results showed that the polyherbal composition significantly reduced mosquito attraction; an optimal combination showed enhanced effectiveness.

KEYWORDS: Mosquito species type, Mosquito life cycle, illness, mechanism of action, herb and Extract.

INTRODCUTION

The mosquito is arguably the most dreadful bloodsucking insect that humans encounter. Numerous diseases, such as malaria, dengue fever, and yellow fever, are known to be spread by Anopheles, Culex, and Aedes fly species. Additionally, the Zika virus, chikungunya, Japanese encephalitis, Rift Valley disease, West Nile virus, and lymphatic filariasis can also be spread by mosquitoes. An immune response is triggered when mosquitoes inject their saliva into a host's bloodstream, where the antigens bind to IgG and IgE antibodies. The reactions usually include lumps in addition to discomfort, itching, and redness. In addition, the mosquito's saliva produces an extremely itchy and unpleasant rash. When humans come into contact with mosquitoes and develop allergic reaction to their saliva, mosquito bites can also result in extremely painful skin inflammation.[1] Medical professionals who care for patients depend on this polyherbal mixture's important logical approach. Using experimental methodologies to demonstrate the effectiveness of herbal extracts was the systematic goal of polyherbal formulations.[2] Significant efforts were made in the past to prevent diseases spread by mosquitoes by the use of polyherbal Simulations.[3] Natural repellents: Although most repellents on the market today remove mosquitoes quickly, they are not the safest choice due to the presence of the dangerous chemical N,N-diethyl-meta-toluamide (DEET). Mosquito-repelling candles made of citronella oil are commonly accessible in the United States.[4] Every year, mosquitoes infect about 700 million people, resulting in over a million deaths worldwide.[5,6] We attempt to use natural herbal ingredients and essential oils with demonstrated mosquito-repelling properties, such as beeswax, camphor, tulsi, neem, orange, lemongrass, marigold, rosemary oil, lavender oil, and lemon oil, to create a safe and non-toxic mixture. Mosquitoes are able to track the presence of their prey thanks to the following sensors:

- Sensors for chemicals
- A heat sensor
- The visual sensor

The different mosquito species and the diseases they can transmit are listed here.

The Aedes mosquito

The diseases spread by the Aedes mosquito include West Nile fever, dengue fever, yellow fever, and Zika virus. Finding black and white markings on their bodies and legs is the main method of identification.

Albopictus Aedes

The Asian tiger is another name for Aedes albopictus. It is responsible for several viral illnesses, including Dengue fever, Zika fever, and yellow fever virus, in addition to certain filarial worms like Dirofilariaimmitis.

They are found in tropical and subtropical parts of Southeast Asia.

Anopheles mosquito

Anopheles mosquitoes are known to transmit dirofilariammitis, brain tremors, and malaria. Usually found in tropical and cooler regions, they are especially prevalent in sub-Saharan Africa.

Yellow fevermosquitoes

The yellow fever mosquito spreads dengue fever, Zika fever, yellow fever, and other diseases. This mosquito was first discovered in African countries, however it is currently present in tropical and subtropical regions of the world.

The Rig-Veda is the earliest work of Hindu literature, having been composed in India 5000 years ago. The Atharvana Veda uses plant material in a much more broad and modified way. The Atharvana Veda included an Upaveda by the name of Ayurveda. Sushruta and Charaka Samhita are two well-known Ayurvedic texts. 395 medicinal plants, 57 animal-derived drugs, and 64 minerals are listed as therapeutic agents in the Charaka Samhita.[7] The WHO pesticide evaluation states that pyrethroids and organophosphates are the most commonly used insecticides in the Americas. DEET is one type of chemical-based insect repellent that is applied to mosquitoes.[8]

Despite being registered, there are possible side effects and warnings for this insecticide, including eye and skin irritation and sleeplessness. Adult mosquitoes are killed by synthetic pyrethroids like permethrin, resmethrin, and sumithrin. A range of plant extracts are also used in insect repellents. Scientists are finding that a number of plant-based insect repellents, like powdered neem and eucalyptus, are equally effective as DEET.[9]

Butylated hydroxy toluene (B.H.T.), an antioxidant included in several repellents, can damage the liver or kidneys if ingested or inhaled. Plant-based repellents, which have insecticidal or repellent qualities, are increasingly being employed as a method of controlling

mosquitoes. Plant powders are naturally occurring and have a strong scent. Plant powder is typically characterised by fine particles and a green hue.[10]

Life Cycle of Mosquito

The life cycle of a mosquito consists of four stages: the egg, larva, pupa, and adult.

Egg

Female mosquitoes lay their eggs at the water's surface. Eggs can be laid byeither group. The eggs require water to hatch, thus it could take a few days or several weeks, depending on the environment.

Larva

Larva also after hatching, they are referred to as "wigglers," Aquatic creatures make up the larvae.

They go through four "instars," or stages of growth. Larvae consume organic materials from the water, including bacteria and algae. They breathe air through a syphon near the water's surface.

Pupa

Mosquitoes progress from the larval stage to the pupal stage, which they call "tumblers" because of their propensity to float in the water. During this stage, when it is not feeding, the mosquito transforms into its adult form. The pupal stage may last a few days to a week, depending on the species and climate.

Adult

The adult mosquito places its body and wings on the water's surface before taking off after emerging from the pupal casing. Adult mosquitoes typically live a few weeks to a few months, depending on the species and location. In order to develop their eggs, female mosquitoes require blood meals, but males frequently consume nectar and other plant liquids.

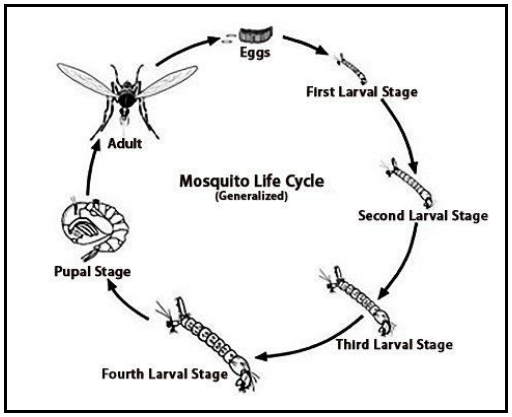

Figure 1: Life Cycle of Mosquito.

Mosquito Born Diseases

Diseases that human's contract from mosquito bites are known as mosquito-borne diseases. The following are a few of the most important:

Malaria

Plasmodium parasites are the cause, while Anopheles mosquitoes are the main vector of transmission. Body aches, fever, and chills are all signs of the flu.

Dengue virus

The dengue virus, which causes dengue fever, is mostly spread by Aedes aegypti mosquitoes. Among the symptoms include a high temperature, joint and muscle pain, eye pain, and a severe headache.

Zika Virus

Usually asymptomatic, this virus—which is also spread by Aedes mosquitoes—can result in serious birth abnormalities if it is infected during pregnancy**.**

West Nile virus

The main carriers of the West Nile virus are Culex mosquitoes. Most infections are not too serious, however some infections can cause neurological disorders.

Chikungunya

Aedes mosquitoes transmit this disease, which is characterised by fever and agonising joint pain.

Yellow fever

The yellow fever virus, which is spread by Aedes and Haemagogus mosquitoes, can cause serious bleeding and liver damage.

Japanese encephalitis

A virus spread by Culex mosquitoes that can cause inflammation in the brain.

Examples of preventative measures include applying insect repellent, wearing protective clothing, and clearing away standing water, which serves as a mosquito breeding ground.

There are vaccines for some illnesses, such as yellow fever and Japanese encephalitis.

Prevention and Control of Mosquito Born Diseases

Individual Safety Steps

Apply repellents

Use EPA-registered products with active ingredients like DEET, picaridin, or IR3535.

Wearing protective clothes

Put on light-coloured, loose-fitting clothes. Consider using permethrin on garments for added protection.

Avert Peak Activity

When mosquito activity is at its peak, which is from early morning until late afternoon, stay inside.

Management of Environment

Eliminate Any Standing Water

Check and empty water-collecting objects on a regular basis (e.g., flower pots, bird baths, tires).

Landscaping

Reduce mosquito habitats by controlling water features and pruning vegetation.

Water Treatment

Use larvicides in larger, non-drainable standing water pools.

Immunisations and Therapeutic Measures Vaccines

Encourage vaccination against illnesses like dengue and yellow fever when it is acceptable. Quick Medical Attention: To stop the disease from getting worse, teach patients how to recognise signs early and seek assistance.

Innovation and Research Genetic Control

Examine ways to reduce mosquito populations or halt the transmission of disease using genetic engineering.

Community-Oriented Methods

Involve local people in study and data collection to tailor tactics for certain areas.

Mosquito repellent

The purpose of insect repellents is to prevent mosquitoes from flying into or remaining on surfaces, particularly human skin. [12] Skin, clothes, and other surfaces are treated with these compounds. By rendering the treated area uninviting or repellent to mosquitoes, they lessen the chance of mosquito bites and the spread of illnesses including dengue fever, malaria, and the Zika virus. Mosquito repellents come in a variety of forms, including coils, lotions, creams, sprays, and electrical devices.

Type of mosquito repellent

Chemical repellents

In which include picaridin, ethyl butyl acetyl amino propionate, and DEET.

Natural repellent

Oils of neem, lavender, rosemary, citronella, and lime eucalyptus.

Wearable repellent

Wearable repellents include clip-on devices and repellent bracelets.

Globally repulsive

Examples of universally unpleasant items include sticks, electric diffusers, plug-ins, coils, dhoops, and candles.

Mosquito Repellent clothing

Clothes coated with permethrin is considered mosquito repellent.

Ultrasonic device

High-frequency repellents.

Mosquito repellent mode of action

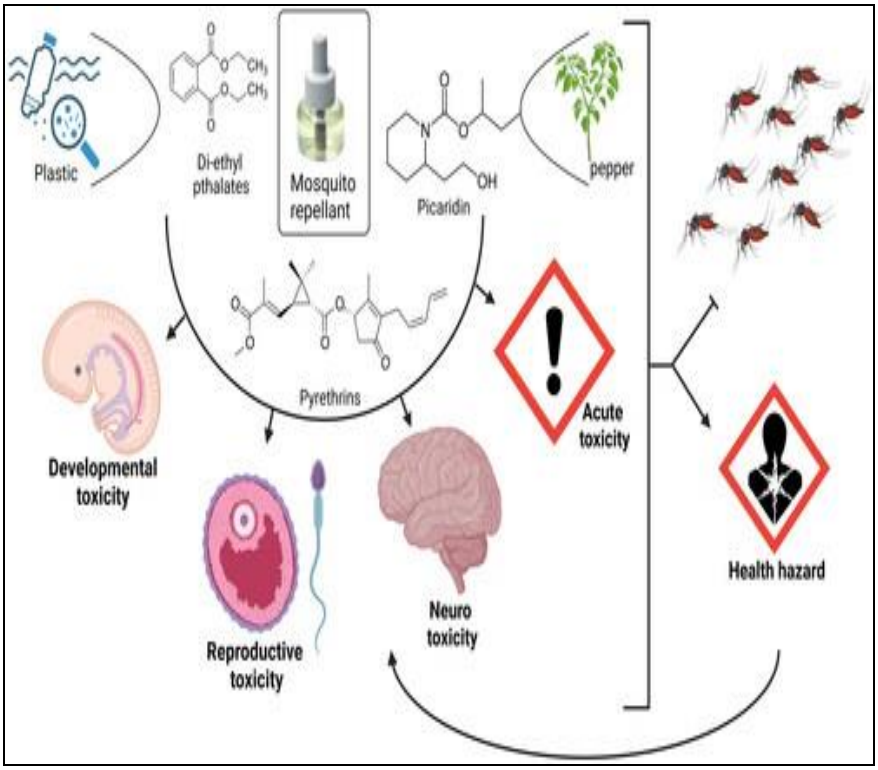

Figure 2: Mosquito repellent Mode of action.

It is well observed that a range of physiological or metabolic processes may give rise to behaviours that are classified as repellent. The lactic acid receptor blocking and subsequent upwind flight elimination, which results in the host being "lost" by the bug, are believed to be thereasons for DEET's ability to repel insects. And research has yielded results.

How lactic acid works in host searches that examine mosquito biology after a blood meal.

Aedes aegypti ceases looking for hosts after consuming blood. At the same time that receptive neurones' sensitivity to lactic acid decreases, host-seeking behaviour also stops. Following oviposition, lactic acid immunity returns to normal.

Mosquito repellents work by either using an odour that mosquitoes inherently detest or by masking the smell of people.[14] Mosquitoes' olfactory and sensory receptors are the targets of insect repellents. When wearing repellents, mosquitoes have a harder time biting humans. Mosquitoes use their sense of smell to detect carbon dioxide (CO_2) and other human odours

in order to locate their hosts. In order to sense the body heat that hosts release when they warm up with blood, mosquitoes use heat sensors. To stop biting and landing, use irritants for skin contact.

Herbs Selection

A polyherbal mosquito repellent candle is a type of candle that uses natural ingredients to ward off insects. Natural herbs that are made from plants are typically employed, together with their essential oils, which have the power to keep mosquitoes away. Chemical-based mosquito control methods are widely used, however because they contain synthetic chemicals, they are dangerous to people.

Due to these toxicity concerns, there is an increasing demand in the market for insect repellents made of herbal ingredients.

Advantage of Natural Insect Repellent Candle

Candles that repel insects naturally are lightweight, portable, and easy to use.

They are both biodegradable and environmentally benign.

They have repelling properties and include essential oil.

They have insect-repelling qualities, are easy to make, and are not annoying or harmful.

Formulation of Poly Herbal Mosquito Repellent Candle

Table No.1

Sr. No	Name	Uses
1	Beeswax	Insect repellent
2	Camphor	Burning, Roomfreshner
3	Tulsi	Anti-inflammatory, Antioxidant
4	Neem	Insecticide
5	Orange	fragrance
6	Marigold	Insect repellent
7	Rosemary oil	Flavoring agent
8	Lavender oil	Insect repellent
9	Lemon oil	Aroma
10	Lemon grass	Insect repellent

Beeswax

Synonym: Yellow wax, Cera Alba

Biological source: Honeycomb of the honey bee, Apis mellifera Linn and other species of Apis

Family: Apidae.

Chemical constituents: Ester of fatty acids and long – chain alcohols.

Figure 3: Beeswax.

Uses

Encaustic painting, candles, cosmetics, lubricants, waterproofing agents, polish, and lost wax casting.

Beeswax is a naturally occurring, low-cost biological polymer composed of many low-cost, non-toxic components. It is also frequently used in the production of controlled-release pharmaceutical formulations. It is an organic insecticide that is also found in mosquito-repelling candles. Beeswax is one naturally occurring material that is highly crystalline.

Camphor

Synonym: Camphora, Gum camphor

Biological source: wood of the camphor Laurel tree (Cinnamomum camphora).

Family: Lauraceae

Chemical Constituent: 1% essential oil (cineol, pinene, thymol, menthol), wood contain around 3%.

Figure 4: Camphor.

Uses

Camphor to relieve coughing, discomfort, and itching. It is also used to treat acne, insect bites, and a host of other conditions.

Mosquitoes have an extremely keen sense of smell. To find them, they smell the carbon dioxide that human bodies emit. As a result, when camphor is burned in an area, the strong aroma repels mosquitoes and confuses them with their own scent. They will scent your residence and be released from their hiding spots.

Tulsi

Synonym: Ocimum sanctum, Ocimumtomentosum

Common Name: Holy Basil, Sacred Basil.

Biological source: It consist of fresh and dried leaves of Ocimum Species like Oscimum sanctum L. And Ocimumbasilicum L.

Family: Lamiaceae

Chemical Composition: Volatile Oil (linolol, eugenol, ocimemene, citral, thymol), vitamins and Mineral, other compound.

Figure 5: Tulsi.

Uses

The stem, leaves, seeds, roots, and flowers are all parts of the plant that have therapeutic properties.

It is used to treat a wide range of illnesses, such as stress, respiratory problems, eye disorders, sore throats, kidney stones, and coughs. People also use it to keep mosquitoes away. It can help to soothe, heal, and revitalise the skin.[17] Reduce the amount of grey hair, stop hair loss, and promote thickness.[18]

Neem

Synonym: Nimba, Margosa.

Biological source: Neem is fresh or dry leaves and seed oil of Azadirachta Indica.

Family: Meliaceae.

Chemical Constituents: Azadirachtin, Nimbin, Nimbidin, Nimbidol, Gednin, Sodium Nimbinate.

Figure 6: Neem.

Uses

Herbal mosquito repellent candles made from neem leaf extract can be used as an insecticide or mosquito repellent. Azadirachtin is the active ingredient in this. It has been shown to stop the larval, pupal, and adult moults of aquatic larvae, including mosquitoes and plant-feeding larvae, as well as their reproduction. One of the safest methods to keep mosquitoes from biting you is to use neem. 70% of mosquitoes may be repelled by neem, and its effects endure for around three hours.[14] Neem's natural antibacterial and antifungal properties make it useful in the treatment of a range of skin conditions, wounds, and infections. Useful as an antipyretic as well.[19]

Orange

Synonym: CortrexLimonis.

Biological source: Lemon peel is outer part of pericarp of tye ripe fruit of citrus Limonis Burm.

Family: Rutaceae.

Chemical Constituents: 23% sugar, 22% cellulose, 25% pectins, 11% hemicellulose, Vitamin C, Flavonoid.

Figure 7: Orange.

Uses

Orange is utilised to help prevent heart disease and cancer, among other chronic illnesses. Because they don't like perfumes, mosquitoes are turned off by the scent of orange peels. Orange peel has been found to be an effective insect repellent. It includes essential oils like limonene that have the ability to repel mosquitoes.[20] Orange peel powder works wonders for cooling hair. Also reducing dandruff.[21]

Lemon Grass

Synonym: Fever grass, Cochin grass, Malabar grass, soft heads, and oily heads.

Biological source: It obtained from fresh Aerial part of Cymbopogon citratus.

Family: Poaceae.

Chemical Constituents: CitralIsoneral, Citonellal, Citronellol, Gerniol, Isogeranial, Geranyl acetate, Germacrene-D

Figure 8: Lemon Grass.

Uses

Cosmetics and perfumed soap are also utilised as repellents. It has musk-related smells, such as lactic acid and human carbon dioxide, together with citronella oil, which attracts mosquitoes. In other words, applying repellent containing citronella oil really stops mosquitoes from smelling particular odours.[22]

Marigold

Synonym: Calendula, geranium, anemone.

Biological source: Its genus of about 50 species of annual herbs of Calendula Officinials.

Family: Daisy.

Chemical Constituent: Limonene, Terpinolene, (Z)- myroxide, Piperitone, Piperitenone, Piperitenone oxide and b –caryophyllene

Figure 9: Marigold.

Uses

Excellent for dry and injured skin, it relieves rashes and pain. The extract from marigold flower petals contains linalool and alpha-terphenyl, which function as repellents and have a 100% fatality rate of mosquito larvae. It has been shown that French marigold blooms offer exceptional mosquito-repelling qualities.[22]

Rosemary Oil

Synonym: Romero,polar plant, Hoja de romeo.

Biological Source: It consists fresh and dry flower of rosmarinus officinalis.

Family: Lamiaceae.

Chemical Constituent: 1,8 cineole (46.4%), Camphor (11.4%), Camphene (5.2%).

Figure 10: Rosemary Oil.

Uses

In addition to being a moderate analgesic, it has been used to treat depression, emotional disturbance, intercostal neuralgia, headaches, migraines, and insomnia. The main reasons rosemary oil works so well as a mosquito repellent are its active ingredients, namely camphor and 1,8-cineole, sometimes referred to as eucalyptol. These substances have the ability to repel insects.[20]

Levender Oil

Synonym: Levenda, Foreign oil, Espliego.

Biological Source: It consists of fresh Flowering tops Levendula Officinalis, L. augustifolia.

Family: Lamiaceae.

Chemical Constituent: It consists of Volatile Oil contain linalyl acetate, linolool, cineol, terpin-4-ol.

Figure 11: Levender Oil.

Uses

Lavender is used in aroma by aromatic therapists to relieve fatigue, headaches, and nervous illnesses.For the treatment of joint and muscle discomfort, it is frequently added to a therapeutic bath. Linalool and linalyl acetate are the active ingredients in Levender Oil, it is well known for its ability to repel mosquitoes. Its ability to discourage insects is aided by these chemicals.[23]

Antioxidant-property chemicals including linalyl acetate and linalool are found in lavender oil.[24]

Lemon Oil

Synonym: Citrus, Citrus Fruit, Cortex limonis, lemon peel.

Biological Source: It consists of fresh peel of ripe fruit Citrus Limonis.

Family: Rutaceae

Chemical Constituent: It consists of Lemon oil contains terpenes, Sesquiterpenes, aldehydes, esters.

Figure 12: Lemon Oil.

Uses

Chemicals found in lemon eucalyptus destroy fungus and deter insects. Mosquito repellent made with lemon eucalyptus oil is used by people.[16]

CONCLUSION

Azadirachtin, the active ingredient in neem extract, may have the ability to operate as a natural pesticide. In addition to acting as a toxin when ingested by mosquitoes, azadirachtin has been demonstrated to directly impair their eating patterns, body growth, and reproductive cycle. A candle is a practical, affordable, and efficient way to ward off diseases like dengue and malaria that are spread by mosquitoes. This natural insect repellent candle won't cause skin irritation or allergic reactions because it is made with natural components. The herbal mosquito repellent candle is incredibly easy to use and transport due to its lightweight design.Using a herbal mosquito repellent candle can protect both human health and mosquitoes. The use of essential oils and plants as a mosquito repellent was found to be very effective and safe. The market's mosquito coils emit a lot of smoke, which can aggravate respiratory ailments, especially for people who have asthma, COPD, or other respiratory disorders. A mosquito repellent with a natural base was successfully created in this study.

The Candle has shown itself to be incredibly safe and efficient. This organic repellent's composition provides the strongest possible protection against mosquitoes and is safe, affordable, environmentally friendly, and easy to use.

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