Design and Evaluation of Herbal Insect Repellent

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Abstract- *Mosquito-borne disease continue to pose significant health globally, necessitating effective and accessible methods for mosquito control. Mosquito repellent candles have emerged as a popular option, both protection and ambiance. This review explores the efficacy, ingredients, and environmental impact of mosquito repellent candles. This study is concludes by highlighting the potential of mosquito management strategies and suggests avenues for future research and development to enhance their effectiveness and eco- friendliness. Also, the aim of this study is to provide a solution to the increase in dengue fever during the rainy season. Plants contain a variety of bioactive substances that are beneficial in improving health and are the main source of modern and traditional medicine in preventing diseases. It is the main source of modern and traditional medicine in preventing diseases. Researchers developed different health problems that support plant pickers on demand. 's goal was to develop a mosquito repellent candle containing Extract of neem,peppermint,marigold flowers,camphor,and rose water, steric acid. candles tested for flame, burn time, and Mosquito control. This can be attributed to the different composition of the oil. The found it to be more effective and less toxic than commercial waxes. Insect repellent helps protect you from malaria-spreading mosquitoes and other diseases such as dengue fever, chikungunya and yellow fever.*

Keywords- Essential oils, Mosquito control, Repellent efficacy, Environmental impact

I. INTRODUCTION

Mosquito borne disease are major human health problem in all tropical and subtropical countries. The disease transmitted include malaria, ilariasis, yellow fever, and dengue fever, the potential vector of lymphatic filariasis, is the most widely distributed tropical disease with around 120 million people infected worldwide and 44 million people having common chronic manifestation(1). Mosquitoes are perhaps the most alarming insect-sucking blood that afflicts humans.The mosquitoes insert their saliva into the host's blood and induces an immune response by binding the IgG and IgE antibodies to the antigens. The reactions cause pain, scratching, redness and often it transforms into the bumps. It's the mosquito's saliva that also creates a severe irritation, scratching rash. Mosquito bites can also cause severe skin irritation via the human interaction with the mosquito via an allergic response to the saliva(2). Natural repellents-Most repellents are available today that can quickly ward off the mosquitoes butare not ideal for the safety as they contain a toxic chemical called DEET. A chemical repellent thatcan make you unattractive in mosquitos eyes is perfect to use. Candles containing citronella oil that are repellent to mosquitoes are commonly marketed in the United States(3). Mosquitoes may be small and short-lived, but they can be harmful to human health. From their bites to the diseases they can transmit, Mosquitoes can often be painful and sometimes fatal. Mosquitoes are members of the fly family. They are so large that most people can easily see them with the naked eye. Insect Repellent is a substance designed to prevent mosquitoes from biting humans and feeding on human blood. Usually contains active ingredients against mosquitoes and other secondary ingredients, which, among other things, reduce the active ingredients to the desired And help release the active ingredients when needed.Therefore, researchers currently list Substances commonly used as insecticides to control mosquitoes. This System is safe, environmentally friendly, inexpensive, easy to use and has many mosquito repellent features. Therefore, Attempts were made to prepare mosquito repellent plant seeds.Pesticides are harmful to health and the environment, they are also very expensive in business and cause negative consequences for the general population. Therefore, there is a need to develop mosquito repellent candles

Benefits of herbal mosquito repellent drug :-

S. No.	Plant Part	Medicinal Importance
1	Neem leaves (extract)	Antihelminthic, antifungal, antidiabetic, antibacterial, antiviral.
2	Marigold flower (extract)	Insects repellent
3	Peppermint leaves (extract)	Anti-inflammatory, antibacterial, Antiviral,antifatigue and antioxidant activities.

4	Temeric extract	Antibacterial,anti-inflammatory,antioxidant, antiviral.

Table 1: Drug data information used in the formulation of mosquito repellents

HISTORY OF REPELLENT -

Traditionally, in many parts of the world, certain plants were used to repel insects and therefore prevent bites. These were used as vegetable oils, cow dung and more. Although most research has been done on artificial (synthetic) species, little progress has been made in the synthetic (herbal) field. Citronella oil, II. It had the first of four recorded uses as an insecticide before World War II, and was used Times as a hair treatment to prevent mental illness. The other three are dimethyl Phthalate; Indalone and Rutgers 612 were invented, patented, and available in formulations 1929, 1937, and 1939. During World War II, three successive compounds in the 6-2-2 ratio: dimethyl Phthalate, Indalone, and Rutgers 612 were rapidly developed for the military, but failed to provide With the expected military protection. The worldwide insect repellent made from N,N- Diethyl-m-toluamide (DEET) was intended for military use only, with the first Products becoming available for civilian use in 1956. Despite the toxic effects of , DEET is still the gold standard for mosquito protection. Side effects include skin and allergic reactions, encephalopathy in children, severe allergic reactions, high blood pressure, and decreased heart rate, and are generally considered safe.

MODE OF ACTION -

Aedesaegypti is affected by lactic acid in human sweat. Studies by others on the behavior of mosquitoes have shown a slight preference for lactic acid alone. This solution cannot detect attractants such as carbon dioxide, lactic acid, ammonia, and Other compounds that protect its owner. It is well known that actions characterized as rejection can be the result of various physiological or metabolic factors. Mosquito repellent caused by DEET is thought to be due to blocking of the receptor on the lactic acid receptor; this eliminates upwind flying and causes the receptor to be "lost" by the insect. Studies have also provided further evidence of the effectiveness of lactic acid in biopsies of mosquitoes seeking hosts after a blood meal. In Aedesaegypti, host-seeking activity stops after blood sucking, infection of lactic acid receptor neurons decreases, and this decrease is accompanied by cessation of host-seeking behavior. Once the eggs are laid, the lactic acid concentration returns to normal. Mechanism of action of pesticides. According to Acree et al (1968), Aedesaegypti is affected by lactic acid in human sweat. Studies by others on the behavior of mosquitoes have shown a slight preference for lactic acid alone. This suggests that their effects, as well as those of carbon dioxide and other unknown components of human odor, may be significant. Compounds such as steroids, phenols, carboxylic acids and indoles secreted by animals. Physiological studies on insects show that mosquito repellents reduce biting rate by interfering with the host's attraction signals and altering sensory information. You hate it. This causes confusion in the mosquito due to overactivation of sensory receptors. Mosquito solutions cannot detect attractants such as carbon dioxide, lactic acid, ammonia and other Compounds that protect the owner. .

PURPOSE OF THE STUDY –

Since most of the mosquito repellent products and ingredients available on the market have been reported to have negative effects on humans, the aim of this study is to develop safe herbal mosquito repellent products.

TYPES OF REPELLENT-

1).Synthetic Insect Repellents:

DEET repels but does not kill insects and is considered the gold standard for pesticides. Although the Was invented in 1953, the public and the federal government approved its use in 1957. More than 200 insect repellent products on the market contain DEET in concentrations ranging from 5-100% as the main active ingredient of . People with impaired ammonia metabolism may experience side effects of DEET. DEET formulations tend to create an air barrier that prevents Mosquitoes from coming into contact with the host's skin. Permethrin is used to treat mosquitoes and fleas. Another example of the active ingredient is Picaridin (2-(2-hydroxyethyl)-1-piperidinecarboxylic acid-1-methylpropyl ester). However, the most frequently reported systemic toxicity of DEET is neurotoxicity, but unfortunately its mechanism is unknown. Additionally, ingestion of DEET often results in nausea, vomiting, hypotension, seizures, and ataxia. Excessive use of On the skin, especially in children, has led to loss of body control, drowsiness, vomiting, Convulsions, and other side effects. There are also reports of impaired embryo development.

2).Natural Insect Repellents: -

Between 1953 and 1974, 872 synthetic and 29 vegetable oils were tested for adverse effects on four different

moth species by the United States Department of Agriculture (USDA). Citronella oil has been used as a pesticide Times in the United States. In 1901, Pesticides were discovered and turned into candles, incense, insecticides, and hair control. Despite their popularity, little research has been done on the effectiveness of these products. Citronella oil , used as a room freshener, has a pleasant air-repellent effect. Cedarwood, Eucalyptus, lavender, cajuput, safrole-free, peppermint oil, and bergamot are combined in different ways according to the laboratory Olfactometer but cannot cause a worse effect than DEET in the olfactometer. Leaves of the neem tree (Azadirachtaindica) and Ocimum spp. Plants. Ash is widely used as a larvicide and insect repellent. In China, Artemisia and Calamus plants were burned to repel mosquitoes and treat malaria. In rural areas. In 1994, a trial was conducted with the insecticide called Quwenling , made from eucalyptus oil. The active ingredient in anti-aging oil Is p-menthane-3,8-diol (PMD). The results of the study showed that Eucalyptus washighly undesirable compared to DEET, causing PMD to be detected and recorded after the study was conducted. According to Abduelrahman H., Ocimumbasilicum (Labiatae) oil has traditionally been used in Sudan to repel mosquitoes, while other studies have shown it to be an antiviral agent. Ethiopian villages were not accustomed to the use of harmful chemicals in cremation. Research by Karunamoorthi and Hailu showed that 70% and 90% of participants in the study conducted by BechoboreKebele in Ethiopia knew and used plants as mosquito repellents. In South Africa, plant species belonging to two families, Meliaceae and Anacardiaceae, are most widely used. Sclerocaryabirrea, Lippiajavanica, Melia azedarach, magniferaindica, Balanitemaughamii in negen anderen.

CLASSIFICATION OF MOSQUITO REPELLENT :-

Mosquito repellents can currently be divided into the following categories:

Physical method of mosquito repellent

Physical mosquito repellents act as a barrier against mosquitoes. Activities related to mosquito repellent methods include using rainwater, old tires, buckets, plastic caps, etc. removal of stagnant water. Bird baths, fountains, ponds, rain barrels, etc. It is very necessary to change the water in the places at least once a week, so mosquitoes cannot find a suitable place to lay their eggs. It is also recommended to cover the With long clothing, especially at dawn and dusk. ‘s windows and screens should be repaired to prevent mosquitoes from entering the home. This category contains Mosquito nets, insecticides and other insecticides available in the market. Mosquito nets are consideredto be a better safety measure than mosquito nets and other pests, especially when sleeping. Such nets provide protection against mosquitoes and other insects.

Mechanical methods of Mosquito Repellents-

It was known that yellow light attracts fewer mosquitoes than white light and that this substance can be used as a mosquito repellent. Other methods that fall under the category of mosquito control methods include fire extinguishers, mosquito nets, etc. takes place. It works by using electric current and ultraviolet light to trap and kill mosquitoes as they arrive.

Chemical methods of Mosquito Repellents –

Pesticides are an excellent way to protect yourself from pests and prevent And insect-borne diseases such as HIV, Lyme disease, Dengue fever, Bubonic plague , West Nile fever and more in two categories depending on the source of the chemical:

Traditional mosquito repellents –

Natural resources capable of killing insects or insects have played an important role in stopping the transmission of viral diseases in both humans and communities. Since the beginning of human society, humans and mosquitoes have lived in close contact, and natural resources have been used to protect against mosquitoes and viral diseases. These Mosquito repellents have been developed and improved since ancient times; This has led to the discovery of Methods of protecting humans .

Synthetic Insecticides –

Although herbal products have long been used to control mosquitoes, they still face problems . Unlike synthetic insecticides, synthetic insecticides have not been adequately tested. In comparison, the strength of these grasses results in the grass appearing to have a short lifespan and wilting easily. Therefore, these devices have limited protection and require frequent re-. Some disadvantages include a strong odor, skin irritation, and possible health risks since Has not been tested for toxicity. Most importantly, the cost of insect repellents is often prohibitive. Due to constraints such as resistance and high costs associated with using natural resources for herbs, extensive research has been initiated on alternatives to natural mosquito repellents.pesticides. Each works differently and has Different features, but they all produce an insect repellent scent, they all work that way.

HERE'S SECTION

1).Neem tree :-

• SYNONYM- Azadirachtaindica,Margosa,Azadirachta
• BIOLOGICAL SOURCE- Azadirachtaindica.
• FAMILY- Meliaceae (Mahogany family)
• USES- **Anti-**InflammatoryAnalgesic Antibacterial.

Arid regions or parts of Asia and Africa are particularly suitable for the cultivation of Azadirachtaindica, which belongs to the family Maliaceae, due to its natural compatibility. Neem is an evergreen tree ranging in size from medium to large , dark brown to dark brown in color and with straight trunks. While its height can reach 40 meters, its width or diameter can also be centimeters. If annual rainfall is between 500 and 1150 mm, Mm is usually needed. Neem is drought tolerant, but has difficulty tolerating waterlogging in poorly drained soils [36]. It has brightly colored dark green leaves and 9-15 pointed leaflets, each 7. Cm long. The flowers are small, white, fragrant and arranged in beautiful clusters and produce Bee seeds. In India, trees usually bloom between February and May. The fruit is a green drupe Elliptical and smooth and covered with seeds. When ripe, the fruits usually turn golden yellow from June to August [36, 37].

Studies have been carried out on insecticides of six species belonging to the Meliaceae family in Different regions of the world. However, the latest pesticide research is based on the Extract of Azadirachtaindica (neem). Scientists were the first to discover the benefits of Neem, but remained unknown to the world until the 1920s when German entomologists discovered in 1959 that Neem trees in Sudan were resistant to attacks by Neem immigrants. Since then, studies and marketing campaigns on neem products have been published.

Uses of neem and its leaves :-

Neem is the most popular tree. In various cultures, the year is referred to as the miracle tree in the Sahel region because it responds to many needs of people in the following ways. Due to the extensive cover, people rest under the Beautiful neem trees. It also acts as a windbreak to protect food crops and buildings from desert winds. The flowers attract bees, which eventually produce pleasant honey and Neem provides food, oil used to make soap and other toiletries, and fuel for lighting and heating; The residue left after the oil is extracted can be used as fertilizer. These Were popular and used by the indigenous people of India and a tree was planted in every family. Additionally, protein residues from palm trees were used to feed chickens. This shows that the fruit and every part of the plant remains useful for humans and animals. Since ancient times, various parts of the Neem tree have been traditionally used as a whole body medicine in India . Additionally, the roots, bark, leaves and seeds of Neem are considered to have great medicinal value; Diseases like leprosy, intestinal infections and worms, indigestion, cough and breathing problems are treated with neem oil and neem extract. It is also known to improve people's health in general. In addition to rheumatism treatment with oil, chronic ulcers due to syphilis and ulcers, eczemaand many other skin diseases are also taken under control. Suryawanshi's study further confirmed the spermicidal effect of neem oil traditionally believed in previous studies. One laboratory study found that just 3 mg of Neem oil could completely kill sperm within 20 seconds with no side effects (). Another in vivo study conducted in the early 1990s showed that applying Neem oil before sexual intercourse produced percent of sex. It can prevent pregnancy completely. Another discovery in the Study was the reversal of neem's anti-fertility effects. Neem seeds and leaf extracts have also been used as an effective medicine against certain infections such as Trichophyton, Epidermophyton, Microsporum, Candida and others.

Neem leaves extract :-

Neem leaf extract is an insecticidal green leafy vegetable. Mosquito killer candles use cow's milk API . that is, it is the extract added when the wax is melted and added. Works as an insecticide or mosquito repellent with

2).marigold flower extract

SYNONYM- Genda
BIOLOGICAL SOURCE –Calendula Officinials
FAMILY-Daisy

Researchers want to use marigold (Tageteserecta) parts as suitable ingredients for Candles, candle/incense sticks. It does not contain harmful chemicals found in Environmentally friendly mosquito repellent products. It contains the unique scent of Insects that most insects find offensive. The smell is caused by a chemical known as "a-terthienyl". It provides natural insecticidal properties to marigolds. Other toxic substances found in Include alkaloids, papain, terpenes and cyanogenic glycosides that are harmful to human health. Also contains pyrethrin,anatural compound that acts as a mosquito repellent. Marigold is said to protect against Pests, including nematodes. Therefore, marigolds are often planted together with tomatoes, capsicum and potatoes. Marigold should not be planted near legume plants due to the antibacterial thiophenes secreted from its roots. Thiophenes

repels aphids, whiteflies, worms and many other animals. A single strain (SSDE) is isolated from flowers of the genus erecta and is reported to contain the insecticide . The flowers contain pyrethrim, a substance found in many pesticides.
Researchers want to use marigold (Tageteserecta) parts as a suitable component of mosquito repellent/insects to be produced. It does not contain harmful environmentally harmful chemicals found in some commercial mosquito repellent products. It contains a specific odor that many insects find unpleasant. The odor is caused by a chemical known as "a-terthienyl". It provides natural insecticidal properties to marigolds. Other toxic substances found in all ingredients include alkaloids, papain, terpenes and cyanogenic glycosides, which are unsafe for human health. It also contains pyrethrin, a natural compound that repels mosquitoes. Marigold is said to provide protection against pests such as nematodes. Marigold is often found in growing tomatoes, peppers and potatoes. Marigolds should not be planted near soybean plants due to the antibacterial thiophenes released from their roots. Thiophenes Is effective against aphids, whiteflies, worms and many other pests. A volatile extract (SSDE) isolated from the flowers of the Erecta species is believed to have high insecticidal activity. The flowers contain pyrethrim, which is found in many pesticides.

3).peppermint leaves extract :-

SYNONYM -menthaoil,colpermin.
BIOLOGICAL SOURCE– Menthapiperita
FAMILY – Laminacea .

Peppermint oil has been found to be effective against dengue virus. Further studies are needed to determine the oil's potential role as an ovulation deterrent and egg-killing agent for adults. Isolation of organic compounds from oil may help improve mosquito control measures. Menthapiperita L. oil (peppermint oil), a widely used essential oil, has been evaluated for its repellent effectiveness against several species of mosquitoes: Aedesaegypti, Anopheles Stephensi, and Culexquinquefasciatus.

4).Camphor :-

Synonym – Gum camphor, Japan camphor
Biological source – Cinnamonumcamphora
Family – Lauraceae.

Mosquitoes have a strong odor. They can see human bodies of carbon dioxide. Now if you burn camphor in the room, the pungent smell will suppress mosquitoes; Moreover, it mixes with their smell and throws them out of the room. In addition, since camphor is known for its smell that permeates every corner of the house, it is not possible for mosquitoes to find a place to hide. And even if they do, the smell will drive them away from your home.

Once you burn camphor, its aroma remains for a long time. Moreover, tablets, tablets, etc. It is also available in different forms such as. The sheets can be hung in rooms where mosquitoes may be present and you will not need to change them for the next 45 days. Moreover, the smell remains in the room. This also helps eliminate bad odors and keep the room fresh.

5). Turmeric :-

SYNONYM :- curcuma, curcumin,curcumae longa.
BIOLOGICAL SOURCE - curcuma longa
FAMILY :- Zingiberaceae

Turmeric is incredibly cleansing. It is an excellent source of antifungal, antimicrobial and antibacterial substances that can help you fight infections and boost your immunity. These magic herbs are rich in vitamins and minerals and support overall health. Turmeric has wonderful antioxidant and anti-inflammatory properties. Turmeric powder and oil work as insect repellent.

6).Rose water :-

- SYNONYM – Gulab
- BIOLOGICALSOURCE-Rosa
- FAMILY- Rosaceae
- USE- antibacterial &Essence

7).Beeswax :-

Beeswax is a natural biological polymer containing a mixture of many non-toxic and inexpensive substances (sour acid esters, alcohols, acids, etc.). The ingredient count is and contains over 300 different types of beeswax. Depending on the type of honey and geographical region, the composition and categories of ingredients may vary only slightly. It is also chemically stable and waterproof . Candles are used in medicine, cosmetics, food, etc. They are natural crystalline products used in areas. It is also used in the preparation of chemicals that release controlled chemicals. It is a class Insecticide and is also used in mosquito repellent candles.

8).Steric acid :-

Stearic acid can be made from animal or vegetable oils. Stearic acid is often used in candle making to make the lamp stronger and prevent it from fading; For this reason, it is

often used in sounds and columns. It is also used to polish the wax, prolong the burning time and preserve the scent.

Formulation of candle :-

Sr.no.	Ingredient name	Quntity (ml)
1	Neem extract	8 ml
2	Marigoldextract	2ml
3	Peppermint extract	3ml
4	Termeric extract	1ml
5	Rose water	1ml
6	Bees wax	225gm
7	Steric acid	15 gm

Tabke no.2 Quantity of ingredients

PROCEDURE :-

- Take the wax and weigh it well _Cut the wax into small pieces and melt it in a beaker at 70 °C. Add steric acid and let sit until dissolved.
- when the temperature drops to 55-60°C.
- Once dissolved well, add neem extract.
- now carefully start dissolving slowly
- now add the specified amount of rose water for aroma.
- after adding all the ingredients, mix for another 15 minutes.
- Pour the mixture in Sutaibal style.
- Apply the compost cold at room temperature.
- After 1 hour, remove the candle from the mold.

EVALUATION OF HERBAL MOSQUITOREPELLENT CANDLE :

Burning Test –

The designed candle was tested for burning for its mosquito repellent habit and Burned Good was tested to burn and performed well.

The candle flame test was developed to detect visible flames in the laboratory. Simple So in answer, the time taken to light a candle and its symptoms such as pain and cough are recorded and recorded in bans damaged at night and in fields above the clock, such as chicken shops and village mansions.
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RESULT :-

Every candle produced is tested in a laboratory in a normal room. In a closed room with a large mosquito population, the burned well from fires by burning a small amount of aromatic Candles and decomposing it with fire, with the overall performance of the Up to that time. Testing showed better quality and performance with an overall performance of . advertised candle.

II. CONCLUSION

One of the active compounds of neem contains azardiractin, which can act as a natural insecticide. It has been reported that when a mosquito eats azardirhaktin, it affects Reproductive organs, causes a physical deterioration in the way it feeds, and has a direct poisonous effect. More than Results have been found to be achieved using neem bark in candle making.

Marigold has a destructive nature that causes crime and candle smell . The plants were safe, environmentally friendly, inexpensive, easy to use, and had high anti-mosquito properties. Neem and cow dung production can help common people earn more.

REFERENCES

[1] Dr.yelmate A.A.,Dr.satpute k.L.,Ms.polawarrutuja,Mr.kanadesuyog,Mr.Homkaratharv .formukation and evaluation of poly herbal mosquito repellent candle ,IJARESM .Vol.10 ,issue by 7,july2022.

[2] Sanjay tanajishelake,Dr.sntoshjain,Asst.prof.waghmodeD.M.,formulation and evaluation of herbal mosquito repellent candle.IJCRT.org.vol.11,issue by 6 june 2023.

[3] Nayanponkiya,shreyadesai,jemishamistry,sweatalpatel,Rajshekharingalhai,Development of economical mosquito repellent using marigold plant.,IJRTI vol.3 issue 11 ,2018.

[4] M.A.ansari,padmavasudevan, mamtatanfon,R.K.razdan,larvicidal and mosquito repellent action of peplermint oil.,ICMR,VOL.7,issue 3 feb.2000.

[5] Abhijeetalok,indradeosingh,shivanisingh,mallikakishore,prakashchandrajha,curcumin pharmacological action and it's role in oral Submucousfibrosis review published online 2015 oct.1,PMC

[6] PatelE.K.,gupta A.,oswalR.J,review on mosquito repellent method International journal of pharmaceutical chemical and biological Scienc.2012,2(3),310-317.

[7] Das kuntal,vasudevac.vasudeva and dang raman.economical Novrl formulation and evaluatuon of herbal oil for mosquito and house fly repellent activities annals of phytomedicine2016:5(2) 91-96.

[8] PrasunasundariP.J.chaylasushma,totasrija,Development of hetbal mosquito repellent formulation and their comparative evaluatuonIJPCR vol.16,issud 6 ,2023
[9] mathewN.Ayyanar E.,shanmugavelu s,etal.,mosquito attract blend to trap host seeking adesAegyptiparasitol res.2013:112:1305-1312.
[10] Tosgratog R.,sanguanpong U.grieo J.P, Ngoenkluen R.,chareonviyaphyp T.,tisgrator R.plant traditionally use as mosquito repellent and implementation for their use and vector conttol,Actatrop.,may 2016, 157:136-44.