

An Organic, User-Friendly and Innovative Approach to Repel Mosquitoes

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Abstract - In the ever-advancing technological world it is almost impossible to function without a smartphone, the company combined both biology and technology and came up with an effective solution. The present invention details compositions for use in repelling insects that are inexpensive to manufacture, easily applied, and/or integrated, and non-injurious to plant and animal life, including lavender oil +peppermint oil+ ppm of pyrethroid+ stabilizer. The existing solution of mosquito repellents, nets, and electric bats have evidently not shown full efficiency in getting rid of these pests. Additionally, the present invention details methods for repelling insects from a person automatically due to the presence of a sensor which can all also be controlled with an in-built app. This review aims to describe the idea behind the company and why it is important and different.

Key Words: Mosquitoes, Technology, Repellents, Innovation, Lavender oil, Mobile phone, Motion sensor, Surveys.

1. INTRODUCTION

Mosquitoes are one of the most important threats to human and veterinary health throughout the planet. The parasites and viruses that are vectored by mosquitoes are responsible for the death of several hundred thousand people each year, with many millions more infected with debilitating consequences [1]. In general, there are two primary strategies used to control the unfold of mosquito-borne disease. For the prevention of transmission of the disease to a subsequent human host, targeting the disease agent is a readily exploitable and often-utilized strategy [2]. The use of repellents to alter mosquito host-seeking behavior is an effective technique for the prevention of mosquito-borne diseases. There are many studies that have shown an association between the use of personal protective equipment and a reduction in mosquito bites and disease incidence [3].

1.1 Repelling Factors and Mechanism

Insect repellent compositions containing essential oils and two aldehydes are being incorporated in the present innovations. These compositions are often developed to be

oil- soluble, cationic aqueous soluble and anionic aqueous soluble relying upon the intended use for the compositions.

Insects have openings at their body surface in the form of tubes by which they are able to breathe. They divide into very fine branches which leads them to all the organs. The Spiracles are water repellent; however, the oil may enter through them. Thus, several insect repellents known within the art contain essential oils. Alas, most of the known insecticides contain chemical compositions which, in certain concentrations, are harmful to the environment. From a study on hairless mice, it was found that lavender oil is quite effective at repelling adult mosquitoes. Lavender has analgesic, antifungal, and antiseptic qualities. This implies that in addition to preventing mosquito bites, it will calm and soothe the skin. While the plants themselves have shown to produce negligible mosquito repellent properties, this plant is widely recognized for its essential oil form. It contains a compound known as linalool, that produces a strong odor that is pleasant to humans and detestable to mosquitos. This is mainly because it overloads their sensitive olfactory organs, similar to the action of DEET.

Peppermint oil is one of the simplest bug repellents, it's not specifically clear yet the reason behind it, but bugs such as mosquitoes find the scent repulsive just as in the case of lavender essential oil.

Purified pyrethrum, referred to as pyrethrins, has been very useful in insect control. It kills a range of insects and mites, knocking them off plants very quickly. Therefore, pyrethrins remain very popular today along with its low toxicity characteristic. They also have desirable environmental characteristics that enable them to break down quickly (within minutes to hours) within the outside environment.

1.2 The Product

The repellent is organic and hence not harmful to the users. The basic idea is to build such a device which can be installed at the back of your phone cover without hampering with the designs. It would be able to detect the presence of the vector within a certain radius emitting the repelling formula.

The main objective is to protect people from deadly insects and flies which could cause airborne disease. The idea has a very innovative and user-friendly approach that is harmful to insects and has no side effects on humans also giving the benefit of being portable and handy.

2. MATERIALS AND METHODS

The product needs a motion-sensing element that will be present in the middle of the phone cover, an app that runs in the background so as to store the data and provide more efficiency, a data transmitter to regulate, a microcontroller to provide assistance, and a micro-battery for supporting and bringing together all these components.

2.1 Minimum Viable Product

The final product shall be made using this design of the embedded prototype. It provides better accessibility and less effort which involves the installation of a vector detecting organic mosquito repellent on the phone cover of a standard mobile phone. This is automatically mechanized with the help of a sensor and an app which will regulate the repellent.

Table -1: Table of components and their description

Components of the Device	
Motion Sensor	Detect and measure movement
Microcontroller	data collection, sensing and controls non-digital electronic systems
Data Transmitter	helps in accessing the phone for the app and a circuit
Micro Battery	for supporting these devices and giving them energy to power

The product also has thin tubes that will contain the repellent. The composition of our organic repellent is lavender oil +peppermint oil+ ppm of pyrethroid+ stabilizer.

The tube is refillable and the covers are customizable.



Fig -1: Prototype of the device

The device is portable that helps to repel vectors (mostly mosquitoes, flies), collect data (types and density) in a given area. The motion sensor detects movement and with the help of the microcontroller and the information stored in the app (which confirms that the moving element is a mosquito) it transmits the data and sends the signal to the pump, so that the repellent is released through the tube attached to the smart-phone cover.

This device has a similar mechanism as the vaporizers used in our homes. It has a mat on the top which will be warmed up by a ceramic plate with a thermistor below it. The formula which will be vaporized contains lavender oil, peppermint oil, and ppm of pyrethrin with the stabilizer (BHT). This device would also contain an ultrasonic microphone for data collection. Since it is on a mobile platform, we would integrate it with an app that would collect data from the ultrasonic microphone to identify vectors to predict the density in the given location.

2.2 Legal Standards and Protocol

The legal standards that we should ensure during the development of this device are to ensure intellectual property rights or IPR. It refers to the elements we have used during the process of developing our device and the app along with it such as app designs, device logo, source code. We have followed the IoT protocols thus enabling us to exchange data in a structured and meaningful way. We have ensured that we have not infringed the IP of a third party. We have placed agreements with our developer search that we all on the resulting IPR. We will ensure the privacy of our users and the protection of data.

2.3 Survey

A survey was conducted online, through Google Forms for which the sample size was 70 people. The target audience was pretty straightforward to select, as it includes people who can afford and use smartphones. They may use it for leisure or for work. Hence, people ranging from teenagers to older working men and women were involved in the survey. This diverse group allows accurate opinion, as all of them could be the potential customers. There were eight option-based questions and two questions were open for individual comments. The survey was conducted to try and understand what the customers expect from our product.

2.3.1 Question 1

Are there insects/mosquitoes in and around your area?
70 responses



Chart - 1: Q1 Results

The majority of our responses showed the presence of mosquito in and around the locality which made it more meaningful for us to come up with this idea and make it a product.

2.3.2 Question 2

Have you or do you know anyone who has suffered from a disease transmitted by insects/mosquitoes
70 responses

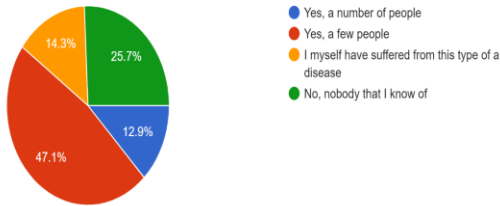


Chart - 2: Q2 Results

Many of the people also know a few of their friends and family who have suffered such vector-borne diseases which makes it all more important that the cases are reduced so as to save many more lives, this is the first step to a greater cause.

2.3.3 Question 3

What mosquito repellents do you currently use?
70 responses

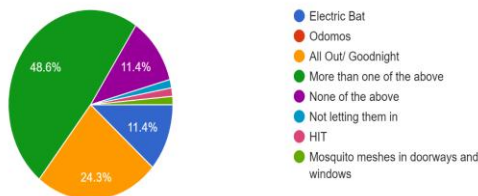


Chart - 3: Q3 Results

Customers are still buying all the currently available mosquito repellents that are not completely helping them at the moment.

2.3.4 Question 4

Whichever of the previous devices/ repellents you use. What do you feel about their price?
70 responses

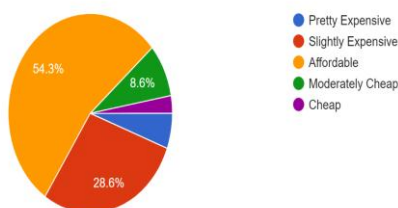


Chart - 4: Q4 Results

The above-mentioned alternative repellents are sold at a moderate price according to most of the survey responses and evidently, the customers are looking for a cheaper alternative.

2.3.5 Question 5

Which type of mosquito repellent do you think will be more effective?
70 responses

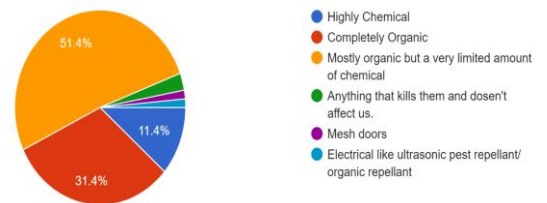


Chart - 5: Q5 Results

The majority of our survey responses were tilted towards the idea of having an organic repellent which is completely understandable as it wouldn't be harmful to us but would effectively kill the vector.

2.3.6 Question 6

How many people staying in your house use a smartphone?
70 responses

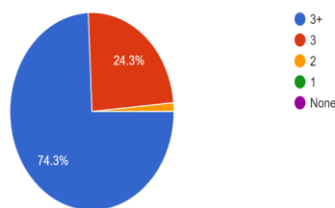


Chart - 6: Q6 Results

As expected, almost all the members of a family have a fully functioning smartphone which is a big bonus for us.

2.3.7 Question 7 and 8

How often do you use your smartphone?
70 responses

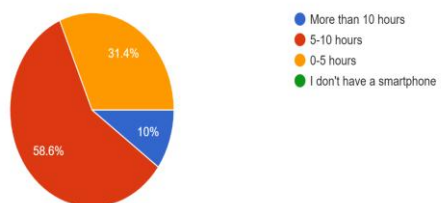


Chart - 7: Q7 Results

Does your phone have a phone cover?
70 responses

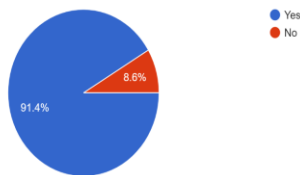


Chart - 8: Q8 Results

The Majority of people use smartphones and phone covers nowadays and for quite an extended duration throughout the day.

2.3.8 Question 9 and 10

The final questions were regarding their opinion and suggestions about incorporating a built-in mosquito repellent system in their smart phone covers and having an app that runs in the background of it. Majority of the results showed positive response and some of them commented about certain adaptations or changes that can be considered, and only a few others were not convinced by the idea at all.

Only a customer centric product development model can ensure maximum chances of success. Therefore, taking into consideration the results of the survey, the product and the business model will be built.

2.4 Business Model Canvas

Taking into account the customer needs and suggestions from the survey, the Business model canvas was developed, also considering the maximum income potential.

2.4.1 Key Partners

Our key partners at the moment will be online shopping websites like Amazon, Flipkart and Coverscart in collaboration with TVS sensing solutions. Once the pandemic situation improves our product will be available in the retail market and the customers will have easy access.

2.4.2 Key Activities

Our product consists of a spray which is synthesized organically and is non-toxic to humans. This spray would be toxic to insects and would kill them. With the help of this device our customers could easily access this with an app in the smartphone and is highly portable. This is completely safe for our customers and they don't have to be carrying mosquito bats with them everywhere.

2.4.3 Value Proposition

This device is very much handy and easy to use since they are being incorporated with smartphones that most of us use in our day to day lives. Therefore, it is much more efficient in

targeting a greater number of mosquitoes. No charging or electricity or smoke involved. It is refillable and can be customized based on user requirements. It is mainly organic and environment friendly and ensures safety of the user.

2.4.4 Channels

Our product would be available through online shopping sites and also through retail shops. We are also planning to extend our service through phone and phone cover selling retail shops and online portals by partnering with them for providing better reach to our customers. With this they would be able to purchase our product from majority of the market space at an affordable price.

2.4.5 Key Resources

Our product can be used on every basic smartphone. Our key resources include motion sensors and app development, as both of these are very essential for the manufacturing and working of the product.

2.4.6 Customer Relationships

The product is customized with a variety of various designs the customer can choose from, the designs do not affect the overall aesthetics of the phone and it is very user friendly. There are a number of colors the customer can choose from, ranging from red to blue and from black to white, a total of 20 different colors are available. This formula of ours is organic and it has a very pleasant scent, it is also portable and easy to handle.

2.4.7 Customer Segments

Customers includes teenagers and people of all age who can afford to buy a smartphone. Every individual from middle class and lower middle class could access our product. It is a very efficient product which would satisfy the needs of people from almost every age group. Using smartphone is something which has been very common nowadays and everybody uses it. Our product will be successful and worth the price for all the customers.

2.4.8 Cost Structure

The standard cost of our product would be around 500-600 rupees (including transportation)

Customized personal covers would cost around 900

Developers salary would be approximately 9000 rupees

Other miscellaneous expenses – 200-700 rupees

2.4.9 Revenue Streams

Main source of revenue will be amazon at this point of time, we can have various Collaborations with the retail market once the pandemic situation improves.

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
Amazon Flipkart	Easy Access Highly portable	Handy	Variety of designs	Teenagers
Coverscart	Non toxic	Easy to use	Customizable	Middle class men
Owner of the manufacturing Industry	Key Resources	Refillable	Pleasant smell	Adventurous people
	Motion Sensor App Development Delivery Personnel	Cost effective	Channels	Trekkers
			Amazon Retail Market	
Cost Structure		Revenue Streams		
Std - 500		Amazon		
Developers salary- 9000		Retail markets		
		Investors		
		Income from the market		

3. CONCLUSIONS

After obtaining the survey results, based on the response, we were able to infer that there are great potential and preferentiality for our product’s idea and design. With the increase in usage of smartphones and the growing awareness regarding environment-friendly products, our device has the capability to satisfy the need of the hour, and hence, we expect a healthy growth of its market.

The vision statement of this product is ‘To lead the way to a safer world with lesser mosquito bites and diseases by applying sound science along with nature friendly elements, right at your fingertips’. As of now the product is cost effective and further Research and Development will be done to try and reduce the cost so that everybody could afford it. We are using online platforms available for marketing and also advertise through social media to make our product available globally.

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