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A Multi-Attractant, High-Voltage Mosquito Eradication System with Rechargeable Power and Integrated Safety Design

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Abstract – *This paper presents the design and partial implementation of an innovative mosquito eradication system that combines a multi-component attractant paste, UV light stimulation, and a high-voltage electrified grid powered by a rechargeable battery. The system aims to provide a sustainable, non-toxic solution to mosquito control by simulating human odor and breath to lure mosquitoes and eliminating them through a custom-designed high-voltage circuit. The attractant paste includes a synergistic blend of lactic acid, octenol, hexanal, ethanol, and controlled carbon dioxide emission through biochemical and chemical reactions. The circuit operates on a general-purpose rechargeable power source. Initial prototype tests demonstrated reliable circuit performance, with visible spark activity confirming voltage output. This work contributes a novel, integrated approach toward effective mosquito management that is suitable for residential applications.*

Key Words: Mosquito Eradication, High-Voltage Circuit, Attractant Paste, UV Light Trap, Rechargeable System, Insect Control Device, Sustainable Mosquito Killer

1. INTRODUCTION

Diseases transmitted by mosquitoes—like malaria, dengue, and Zika—remain a major health concern worldwide, especially in tropical and subtropical climates. Conventional mosquito control methods, including insecticide sprays, coils, and basic electric zappers, have shown limited efficacy and may introduce environmental or health risks [1]. Furthermore, increasing resistance to chemical insecticides has reduced their long-term viability.

In response to these limitations, this research proposes a novel, integrated mosquito eradication system that combines chemical, electrical, and optical components into a unified solution. The objective is to enhance mosquito attraction through biomimicry of human breath and sweat while delivering an energy-efficient and high-impact electrical elimination. The system is designed with sustainability and safety as key features, making it applicable to residential and low-resource settings.

2. SYSTEM DESIGN AND OVERVIEW

This section outlines the core components and working principles of the proposed mosquito eradication system, which integrates chemical, optical, and electrical technologies into a single, efficient device. The system is built with a focus on ease of use, operational safety, and multi-channel mosquito luring to improve eradication performance.

2.1 Mosquito Attraction Mechanism

UV Light Source: The system uses a high-power 365nm UV LED to simulate the visual stimuli mosquitoes naturally seek during nocturnal activity [2]. The UV LED serves as a primary lure, particularly effective in low-light conditions, directing mosquitoes toward the core elimination zone.

Multi-Component Attractant Paste: The innovative attractant paste is formulated to mimic human breath and sweat, integrating both biochemical and oxidative methods to generate carbon dioxide (CO_2) and odor mimics.

- CO_2 Release Strategy: The system employs multiple reaction methods to generate carbon dioxide, including fermentation using sugar and yeast, a citric acid–baking soda reaction, and the hydration of calcium oxide for extended emission phases.
- Odor Components: Lactic acid, octenol, hexanal, and ethanol simulate sweat and skin volatiles [3].
- Supplementary Oxidation: Carbon dust and potassium permanganate ($KMnO_4$) react to release additional CO_2.

The attractant paste is designed for slow, controlled release over 2–3 days, enhancing long-term lure effectiveness.

2.2 High-Voltage Elimination System

Oscillator Circuit: A basic driver setup generates pulses to activate the transformer, enabling voltage amplification in the system. The output of the transformer is connected to a basic voltage multiplying stage to generate the required high voltage needed for mosquito elimination.

Electrified Mesh Grid: A stainless steel or copper wire mesh with 1–2mm spacing receives the high-voltage output. Mosquitoes that come into contact with the mesh are instantly neutralized by the high-voltage discharge.

2.3 Safety and Protective Measures

- High-voltage insulated wires prevent leakage and accidental contact.
- A high-resistance limiting resistor ensures current remains low for safety.
- The system is enclosed in a protective casing with appropriate ventilation and warning labels.

2.4 Power Supply

The device is powered by a single rechargeable battery, offering a simple and reusable energy solution. Charging is done using an external DC adapter, which powers the battery and enables reuse after discharge. This simple setup is designed to be cost-effective and easy to maintain for basic field use.

3. PROTOTYPE IMPLEMENTATION AND TESTING

The physical prototype of the proposed system consists of a compact enclosure featuring a hollow central chamber designed to house the multi-component attractant paste. The top cover of the device incorporates the electrified mesh grid and a strategically positioned UV LED. This arrangement ensures that once the paste is placed inside and the system is powered on, mosquitoes attracted to the UV light and odor cues enter through the top section and come into contact with the electrified grid.

Fig -1: Top view of the prototype showing the mesh grid and UV LED arrangement.

Initial circuit integration efforts successfully demonstrated high-voltage generation through a basic zapper circuit, visibly confirmed by spark generation across the grid. Although a finalized printed circuit board or enclosure was not developed at this stage, the working prototype validates the system's elimination capability.

Additionally, field observations confirmed the effectiveness of the attractant paste alone. Samples of the paste were deployed at various outdoor locations around the campus. Within a few hours, visible groups of mosquitoes were successfully drawn to the paste and became trapped within it. Photographic evidence was collected to support these findings.

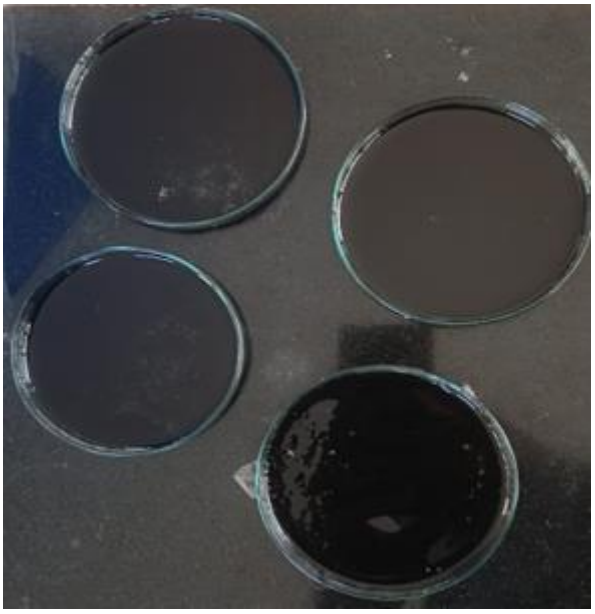

Fig -2: Mosquitoes attracted and trapped by the paste during field testing.

Fig -3: Zoomed view showing clearly visible mosquitoes attracted to the paste during outdoor testing.

These results, while early-stage, demonstrate both components of the system functioning as intended: effective mosquito attraction and confirmed electrocution via high-voltage discharge. Further testing with an enclosed circuit and long-term deployment is planned as future work.

4. DISCUSSION

The development of this mosquito eradication system addresses key limitations found in traditional control methods by integrating multiple attraction mechanisms and a robust high-voltage elimination module. Integrating UV illumination with a chemically active attractant enhances both the reach and targeting efficiency of the mosquito lure system. Moreover, the high-voltage discharge mechanism ensures rapid elimination without the use of harmful chemicals.

The use of a general-purpose rechargeable power system and a simple oscillator-based circuit makes the design practical, economical, and easily deployable. These features make the device particularly suitable for everyday use in low-resource environments.

Challenges remain, particularly regarding the optimization of component durability, attractant paste longevity, and long-term circuit reliability. The prototype's success in initial attraction and electrocution tests justifies further development toward a fully integrated and manufacturable solution.

5. CONCLUSIONS

This study introduces a novel mosquito eradication device that combines biochemical and electrical mechanisms to attract and eliminate mosquitoes in a safe, sustainable manner. Through its integration of UV light, a multi-component attractant paste, and a general high-voltage circuit, the system demonstrates promising functionality during early-stage testing. While a fully enclosed and long-term deployable prototype is still in progress, initial results validate the system's conceptual integrity and practical potential.

Future improvements will focus on refining the mechanical enclosure, improving the attractant's stability in diverse climates, and automating activation mechanisms. With further development and large-scale testing, this device could serve as an efficient alternative to traditional mosquito control methods, especially in high-risk and underserved regions.

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