



# Study of LED Radiation Effects on Insect Phototaxis Response for the Development of Light-Based Pest Trap

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**Abstract:** Commercial agriculture is a resource intensive industry that employs significant amounts of agrochemicals to maintain a high yield output. Excessive application of insecticides has detrimental impacts on human health, environment and long-term sustainability. One particular area of interest is in exploring how insects are attracted to specific bands of the visible light spectrum. This paper details the study of several light conditions using Light Emitting Diodes (LEDs) to determine its phototaxis response on the common grasshopper, garden moth and lava beetle. The results conclude that all three insects exhibit positive phototaxis response on wavelengths around 491nm and below, which encompasses ultraviolet, blue and green. The radiant intensity experiment revealed a threshold response of 2.8mW/m<sup>2</sup>, or 25m in reciprocal distance.

**Keywords:** Insect, phototaxis response, wavelength, radiant intensity, ultraviolet light, Light Emitting Diode, agriculture, Sarawak, Pulse Width Modulation, visible light, electromagnetic radiation

## 1. Introduction

Insecticides are a groups of synthetic organic chemical used to control insect population. In agriculture, these agrochemicals are typically applied to reduce crop loss from insect damage in order to maximize yield.

The major point of concern insecticides is their persistence in the environment. The accumulation of insecticides when metabolized can cause a plethora of ill effects to the human body development, wildlife, and vital agriculture pollinator health. In efforts to reduce reliance on these agrochemicals, several alternatives have been proposed and applied with varying levels of success, all part of a broader concept known as Integrated Pest Management [1-6]. However, these approaches have limitations in their ability to substitute insecticides role due to its broad spectrum effect. Some other hurdles include accessibility, farmer's knowledge and training and economics [7].

One promising technology of interest is a light trap system. In a nutshell, utilizing specific bands of the electromagnetic radiation to attract flying pest. At the moment, a majority of research on light-based trap systems are optimised for on-field insect capturing and monitoring functions. However, there is optimistic interest that these existing prototypes can be adapted to serve as insect elimination tools. Combined with other modes of pest control, the light trap technology could potentially be a major component in reducing pest infestation.