IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

+ Development project of agricultural self-powered intelligent insect collector killer with multiple wave length light- A Review

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Abstract: The agriculture sector has seen a paradigm change in recent years towards the incorporation of cutting-edge technologies to improve sustainability and production. In order to reduce losses and increase overall output, creative solutions are required because to the persistent threat that insects provide to agricultural products. The invention of an agricultural self-powered intelligent insect collector killer with different wavelength lights is examined in this research. Innovative technologies like intelligent insect detection and self-powering mechanisms promise a sustainable and successful approach to agricultural pest management. Numerous insect pest species are immediately detectable and track-able. To enhance integrated pest management in the context of precision agriculture, a number of systems have been developed. For numerous significant pests, automatic detection traps have been created. These methods and for the purpose of promptly identifying and keeping an eye on harmful and quarantine pests, modern technologies hold great promise. This advanced agricultural tool's main features, functions, and possible effects are covered in the study.

Keywords: Agriculture, Environmental Concerns, Natural resources, Insect-Pest population, Self –Powered Insect Trap, Automated trap.

I. INTRODUCTION

Agriculture is undergoing a new revolution as a result of growing Concerns regarding pesticide use and throughout environment, over reliance on natural resources, growth of material trade internationally, expansion population, altered consumer designs, and technological advancements. This revolution involves managing

natural resources and agricultural inputs more efficiently while using digital tools to boost productivity [1]. With the aid of precision agriculture instruments, farmers may examine the variability of a number of important variables that influence plant productivity and health. Sensors provide the data, which are then aggregated and stored on digital platforms to help with decision-making.

Integrated pest management methods are being developed with the goal of better managing insect pests by concentrating on more targeted treatments and minimising the overall usage of pesticides. However, the precision of the selected pest population monitoring technique determines how effective these systems will be. Insect pests are a major problem for agriculture worldwide, resulting in large financial losses and jeopardising food security [2]. One potential solution to these issues is the creation of an Agricultural Self-Powered Intelligent Insect Collector Killer that uses several wavelength LEDs. An extensive evaluation of recent works in the field of insect autonomous detection and monitoring is covered in this study. Additionally, since the bulk of pertinent publications were centred on a select few insect orders Lepidoptera, sucking insects, Diptera (fruit flies), Coleoptera (weevils in palm trees), and The purpose of this review is to illustrate the methods used for these insect orders [3].

1. Automatic Monitoring of Lepidoptera Pest Species:
   Many species of butterflies and moths, including the codling moth Cydia pomonella, the diamondback moth Plutella xylostella, and the gipsy moth Lymantria dispar, are known to significantly reduce crop yields in many different parts of the world [4]. When populations are well-developed, these insects can deposit a lot of eggs, and their larval stages eat a lot, which directly defoliates leaves, inflicting enormous losses [3].

Figure 1 Fruit flies and moth species are tracked using an automated trap.

2. Automatic Monitoring of sucking insect:
   One of the main things that leads to losses in greenhouse settings is sucking bugs. When crops are grown in crowded conditions in enclosed spaces, thrips, aphids, and whiteflies are among the most troublesome pests. Sticky traps are typically used in greenhouses to keep an eye on these pests' populations. The size, intricate morphology, and low efficiency score of human observers who are tired or inexperienced make this procedure a challenging undertaking for non-specialists [5] [6].

3. Automatic Identification and Monitoring of Fruit Flies:
   Fruit fly damage can result in 80% to 100% of crop losses, based on the crop and the lack of protective measures [4]. The Dacini tribe includes 932 species of fruit flies, 10% of which are presently regarded as pests in commercial fruit and vegetable production, resulting in trade restrictions and quarantines [5]. Among other species, females of Bactrocera oleae (Gmelin), Ceratitiscapitata (Widemann), and Bactrocera Dorsalis (Hendel) display high rates of reproduction [7].

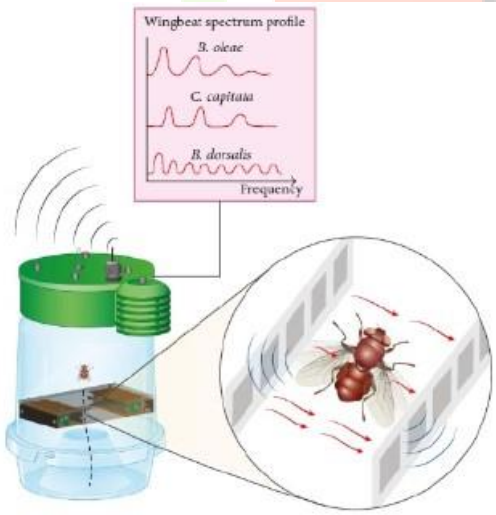

Figure 2 The schematic of an automated acoustic insect trap with sensor is called an echo-acoustic trap and sensor.

II. Literature survey:

1. Solar Energy-Based Insect Pest Trap
   Authors: Nichanant Sermsria, Chonmapat Torasa
   According to the author, Thai people work primarily in agriculture. Every year, different kinds of insect pests cause damage to crops and reduce output for farmers. As a result, farmers must apply insecticides to protect their crop [8].

2. Design and Fabrication of Automated Solar
Insect Trap, International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 –8958, Volume-6 Issue-4, April 2017
Authors: Ananya M1, Gagan Y2, Hemachandan H3, Prof. Sathish H4
The author of this study explains that controlling insects is the largest problem facing agriculture. Using a lethal chemical pesticide to shield the crop from insect damage is standard procedure. Using a chemical has a lot of adverse effects. Farmers are burdened financially when they use more insecticide. Additionally, the food gets tainted. Using an environmentally friendly automated solar-powered insect trap, pests can be effectively managed in organic and integrated farming practices. Solar traps are really easy to use and create [9].

3. Automatic Detection and Monitoring of Insect Pests
Author: Matheus Cardim Ferreira Lima, Maria Elisa Damascena de Almeida Leandro, Constantino Valero, Luis Carlos Pereira Coronel, and Clara Oliva Gonçalves Bazzo.
Published: Received: 26 March 2020; Accepted: 18 April 2020; Published: 9 May 2020
This work enables the automatic identification and tracking of certain insect problem species. Many methods have been developed within the precision agriculture framework to improve integrated pest management (IPM). There are automatic detection traps designed for certain common pests. These techniques along with developing technology show considerable promise for the early detection and monitoring of pests that require quarantine and that are aggressive. The purpose of this study is to review the state of the art in science and methodology for using sensors for automatic detection and monitoring of insect pests [10].

III. Proposed design:

1. Self-Powering Mechanism:
    a. The autonomous self-powered insect collector or killer project presents a significant advance in that it operates on its own energy source, negating the need for external power sources. This system uses photovoltaic cells to capture solar energy, which guarantees the sustainability and independence of the gadget. An automatic self-powered insect collector or killer can operate more efficiently and consistently, even in low light, by incorporating energy storage technologies, like sophisticated batteries.
2. Intelligent Insect Recognition:
    a. This reduces the impact on non-target species by allowing the device to distinguish between beneficial insects and dangerous pests. Real-time insect identification and accurate targeting are made possible by sophisticated sensors, cameras, and image processing algorithms.
3. Multiple Wavelength Lights:
    a. The self-powered insect collector or killer is automated and uses lights of various wavelengths, such as visible, infrared, and ultraviolet (UV). This multifunctional strategy improves the device's ability to draw in and get rid of a variety of insect pests. By choosing particular wavelengths, the autonomous self-powered insect collector or killer can maximise its targeting precision while also accommodating the different visual sensitivities of the insects.

IV. Potential Impacts:

1. Environmental Sustainability:
    a. The environmentally sustainable feature of the autonomous self-powered insect collector or killer is its reliance on solar energy and its capacity to control specific pests. Through the reduction of chemical pesticide usage and energy consumption, the gadget supports international initiatives to support environmentally friendly farming methods [11].
2. Increased Crop Yields:
    a. The overall effectiveness of pest management is increased when insect pests are precisely targeted with several wavelength lights. Farmers should anticipate higher crop yields and better quality as a result, which will benefit food production and financial results.

V. Conclusion:

The development of an Agricultural Self-Powered Intelligent Insect Collector Killer with Multiple Wavelength Light represents

a significant stride towards sustainable and efficient pest management in agriculture. The integration of self-powering

mechanisms, intelligent insect recognition, and multiple wavelength lights positions the Automatic Self powered Insect

Collector-Killer as a promising solution to address the challenges posed by insect pests. Further research and field testing are

essential to validate its performance and explore its potential adoption on a larger scale.

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