Pest Management

using Photoresponse

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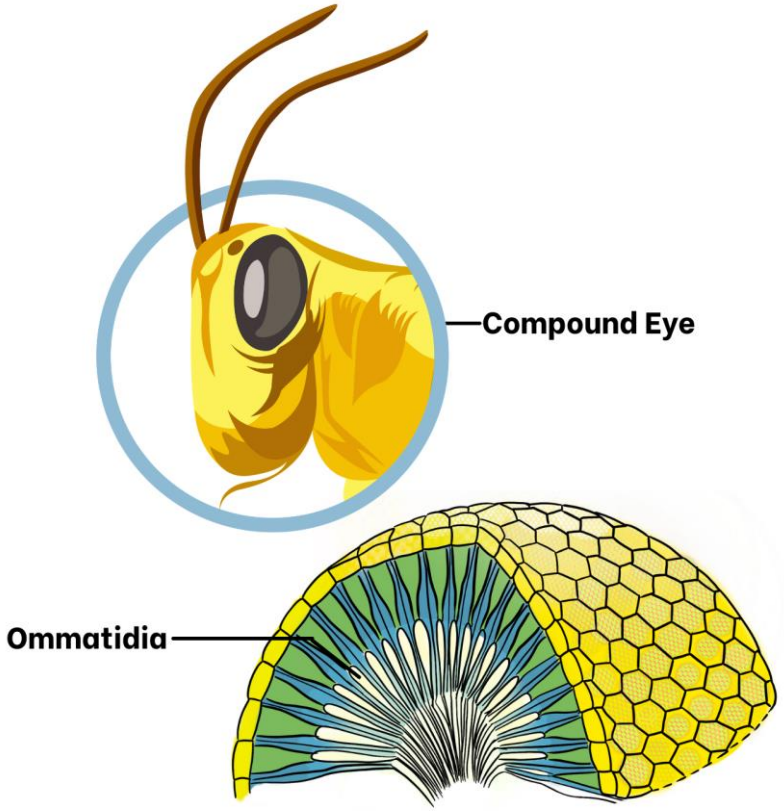
Introduction & The Team

Pest control in India is mainly based on **agrochemicals**, which have **increased health degradation**. In the agroecosystem, **carcinogenic additives** are being used that are harmful to all life forms. This circumstance draws researchers' attention to the development of **non-chemical pest management** techniques. Technologies involving photoresponse are already being effectively used against residential pests, but this system has yet to be tested on the **agricultural sphere at a large scale**.

SUVRA SHAW

SUDIPTA SARKAR

Insect Anatomy



- **The Compound Eye**

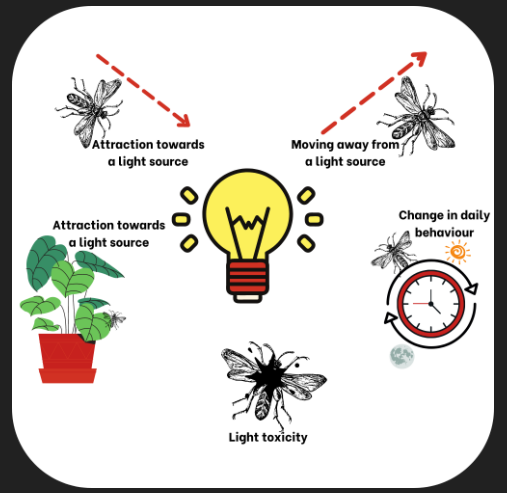
Cornea, lens, and photoreceptor cells make up tiny independent photoreception units that distinguish brightness and color.

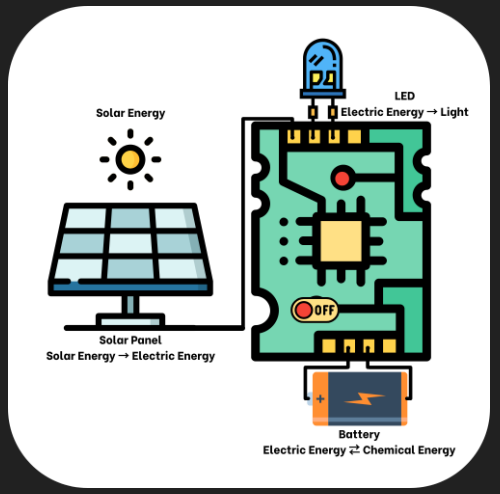
- **The Ommatidia (Singular: Ommatidium)**

Ommatidia work together to give mosaic images. These compound eyes are highly sensitive, can trap even UV lights.

Use Of LEDs in Pest Management

- **Humans** see a light spectrum ranging from **400-700nm**. Most **insects**, on the other side, can only see light ranging from **300-450nm**. For attracting pests, the range of 380-420 nm is best, as it is the **core range for UVA** light, which is one of the most significant aspects in luring insects.
- Light-emitting diodes or **LEDs** are becoming increasingly popular for pest control for their **efficiency & longevity**. According to some studies, LEDs emitting the UV-A Spectrum (370-410nm), blue (460nm), or their blends are **appealing to the pests**.





- The inadequacy of an **electric distribution system** permeating the **cultivation areas** is a serious obstacle to using light traps for tracking or even regulating irrigated crop pests. Researchers have implemented a system of **autonomous light bait** that uses **photovoltaic solar energy** to **power** the electronic device to resolve this hindrance. It will have **low-energy-consumption LEDs** installed as a source of light. Until then, all planned and manufactured autonomous light traps used the BL fluorescent lamp, which required a large battery bank to power.

Other Barrier Methods

- Insect repellent performance has been found in **plastic mulch** with the metalized silver sun glinting top surfaces. Silver mulches increase photosynthesis by **reflecting sunlight** up into the canopy's undersides. The silver mulch's reflective surface **increases the intensity of light**, which deters whiteflies, aphids, and other bottom-leaf-dwelling insects. These pests usually congregate on the shadowy undersides of the leaves. The sun reflects off the mulch, **illuminating the lower part of the leaves** and affecting the insects' phototaxis.

- Running **yellow or green light** sources in the orchard at night can effectively deter damage. This method takes advantage of the fact because when **insects come into contact with light over a certain luminosity at night, their compound eyes adapt as if it were daytime, suppressing night-time traits** like flying, sucking the liquid from fruit, and breeding. LED lighting has become more affordable and capable of producing **highly monochromatic light** around the spectrum, from ultraviolet to red.

Recent Developments & Future Scope

Solar-powered light traps are already being used as an **eco-friendly** measure and a part of the "**Make** in **India**" campaign in South Indian farms. The light emitted by these devices **inhibits the ommatidia** region in the compound eye of an insect.

It **lowers the average annual cost of pesticides** while also **improving crop health** by **removing harmful chemicals** from the equation. As the pest infestation is reduced, the average **annual wastage of agriproducts can be reduced** as well. Furthermore, because no pesticides are used, the crops have a lower risk of causing any harmful chemical effects when consumed.

THANK YOU.