Grower Summary

CP 088

Enhancing the monitoring and trapping of protected crop pests by incorporating LED technology into existing traps

Annual 2012

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Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Project Number:	CP 088
Project Title:	Enhancing the monitoring and trapping of protected crop pests by incorporating LED technology into existing traps
Project Leader:	Dr Andy Evans
Contractor:	SRUC
Industry Representative:	Alan Davis
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Project Cost:	£43,700

Headline

A system to take advantage of the attraction of crop pests to specific light spectra is being developed using LED's and sticky traps, to allow early detection and better timing of pest management.

Background

Pest management is a high priority for growers and insecticide use is discouraged where possible. Efficient and effective pest management requires precise timing of biological and/or chemical applications to the crop and an assessment of their effectiveness post-application, to determine whether any further applications are required.

Currently, sticky traps (often coloured) are used to detect the presence of many pests (e.g. thrips, whitefly, various aphid species, leaf miners, fungus gnats) and a decision on whether to begin application of biological control agents (BCA's) and/or insecticides is often based on whether pests are being found on the traps. Traps rely on their attractiveness to these pests, and exploit the behavioural attraction of the pests to their colour. It has been known for many years that specific colours are attractive to specific pests, such as blue for thrips, yellow for whitefly, white for mushroom flies. Recent research has indicated that traps can be made more effective through the use of light emitting diodes (LED's) incorporated within the trap. For example, the capture of tobacco whitefly (*Bemisia tabaci*) was enhanced by 100% through the addition of a lime-green LED (530 nm wavelength) to the trap. Similarly, a 250% increase in trapping efficiency for Western flower thrips (*Frankliniella occidentalis*) was obtained on blue sticky traps that had a blue LED (465 nm wavelength) incorporated with the trap.

Various researchers have looked at the use of LED's to enhance the efficacy of insect trapping, particularly of biting pests such as mosquitoes, but there is relatively little work on exploiting this on a commercial scale to enable growers to incorporate these traps into their IPM programmes.

To determine what colour of LED will enhance attraction of specific pests to a coloured (yellow or blue) sticky trap, the sensitivity of the insect eye to a range of light wavelengths (i.e. 'colours') needs to be determined, coupled with behavioural studies to confirm that they are attracted to that specific wavelength of light. To determine the colour sensitivity of the eye of a range of pests, a technique called 'electroretinography' is being used, which involved detecting the response of receptors in the insect eye to flashes of different light wavelengths. Using this approach we can determine a specific light wavelength that the eye is sensitive to (e.g. green, red, blue etc). Behavioural tests will confirm whether the insect

under study is attracted to that particular ‘colour’. LED’s that emit that specific ‘colour’ can then be attached to standard yellow or blue sticky traps and evaluated in protected crops to assess whether they enhance the capture of specific pests compared to traps without LED’s.

This project aims to bring together expertise in insect behaviour and response to visual stimuli at SRUC and the Organic Research Centre (both research and knowledge transfer organisations) to develop and evaluate the potential use of LED’s with existing colour traps used for pest monitoring.

Specifically, the project aims to identify the light spectra that are most attractive to a range of protected crop pests and their biological control agents; screen LED’s of specific light wavelengths that can be used with traps to enhance the attractiveness of traps to pests; evaluate the efficacy of LED/trap combinations for their use in trapping pests under protected crop conditions with a small group of growers; supply prototype LED traps to a wider group of growers to evaluate under commercial conditions for their effectiveness in contributing to enhanced IPM of specific pest/crop situations; and devise IPM approaches that utilise the novel LED traps for use against specific pests.

Summary

Much of the first year has involved developing the electroretinogram set up, as well as the behavioural chamber experiments and trap design. Trap comparisons were run at 4 commercial sites and showed promise for the attraction of sciarid fly, and diamond back moth to green (540nm) LEDs clipped to yellow sticky traps. There was no increase in the capture of *Encarsia formosa.*

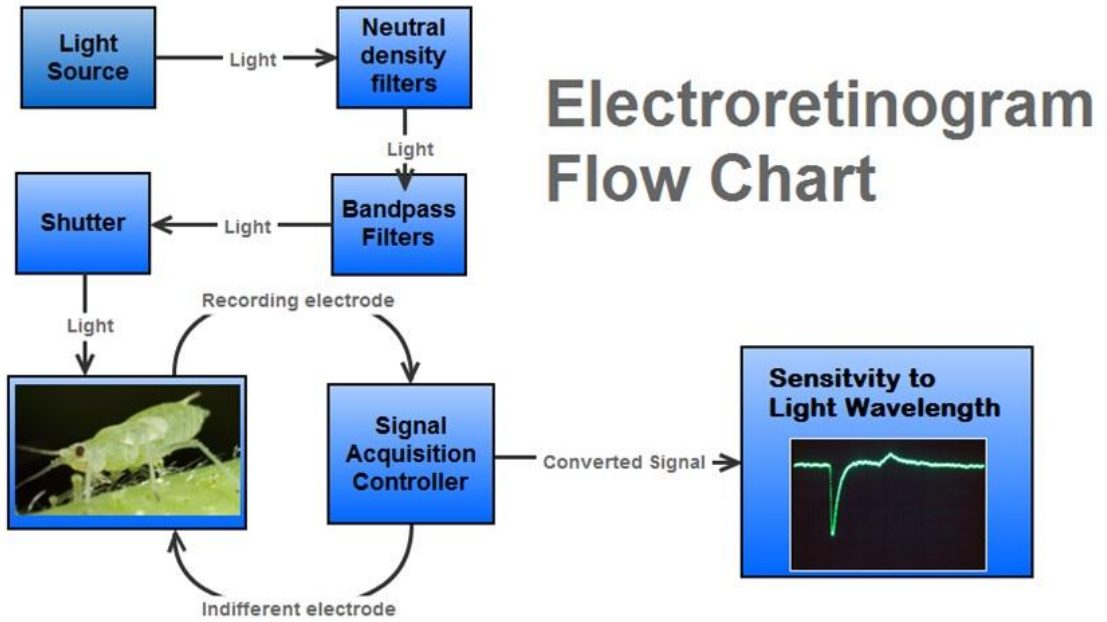

Figure 1. The subject's eye is pierced by a recording electrode; an indifferent electrode is placed into the body. An output is then obtained by exposing the eye to short flashes of light across a range of narrow wavelengths. By measuring the magnitude of the response to these wavelengths, the spectral sensitivity of the insect can be determined.

Financial Benefits

LED's are now relatively cheap (~10-30p per unit, depending on wavelength and output) and have a very long life - >50,000 hours. If powered from the mains within a protected crop, the cost is estimated to be in the region of £0.08 per LED, per week, as the LED's do not require much power to work. In the absence of mains power, LED's can be powered by batteries, but this does increase the cost.

If the LED traps can be shown to enhance the monitoring of specific pests within protected crops, particularly by early detection, the improvement in timing of use of insecticides and/or release of biological control agents would be of economic benefit to the grower.

Action Points

There are no grower recommendations at this early stage of the project.