Scientists aim to stamp out new horticultural pest

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Credit: University of Lincoln

Scientists will pursue cutting-edge microbiology and robotics research in a bid to stop a destructive and abundant pest which is now threatening fruit production around the world.

Teams of researchers from the University of Lincoln, UK, will embark on two ambitious new studies with the aim of reducing and ultimately

preventing the damage caused by *Drosophila suzukii* - a major agricultural pest affecting soft and stone fruit crops, which first arrived on British soil in 2012.

Commonly called the 'spotted-wing drosophilia', the fruit fly originates from South East Asia and its rapid spread across Europe and America is a now significant cause for concern among international fruit growers. Unlike other drosophilia species that are only attracted to rotting fruit, this pest invades fruit early during the ripening stage before growers have the chance to harvest, causing substantial economic losses.

In recent years, annual financial losses for American growers in California, Oregon and Washington have totalled $511 million and similar damage is now occurring across Europe. In 2011, some regions of France and Spain lost 100% of their cherry crops to spotted-wing drosophilia.

The UK's Agriculture & Horticulture Development Board (AHDB) has awarded research funding to support two PhD studentships at the University of Lincoln, which will be dedicated to tackling this increasingly urgent global food security issue.

Supervised by Professor Matthew Goddard from the University's Lincoln Institute for Agri-food Technology (LIAT), and Dr Michael Mangan, based in the Lincoln Centre for Autonomous Systems (LCAS), these new projects will explore different ways of stopping the spotted-wing drosophilia species in its tracks.

Professor Goddard, an evolutionary biologist based in the School of Life Sciences at the University of Lincoln, explained: "Female spotted-wing drosophila cut through the skin of the fruit so that they can lay their eggs inside. A single female can lay up to 60 eggs per day and 200-600 eggs in her lifetime, all randomly distributed between different fruits. These

eggs develop into larvae, which make their own breathing holes and feed on the fruit, turning its flesh brown and soft.

"This pest is already having a massive impact on the global production of soft summer fruits such as strawberries, raspberries, cherries, plums, peaches, nectarines, apricots, and grapes, and we therefore need to find a viable solution that will stop the drosophilia getting to these fruits in the first place. There is currently a drive to reduce the levels of traditional crop protection products used in food production, so finding alternative methods is absolutely crucial."

Professor Goddard's project will examine whether different species and strains of yeasts can be used as bait to attract the spotted-wing drosophilia before they reach their usual fruit targets. Commercially available baits are not currently showing a strong attraction in comparison to fruit, but Professor Goddard's previous research has already found that particular strains of yeast are attractants for other drosophilia species. His PhD researcher will therefore examine whether yeast can be used in 'attract and kill baits' for control in early and late season fruit production.

The project will represent a novel collaboration between the University of Lincoln and NIAB EMR - a UK organisation dedicated to research into horticultural crops and plants, and their interactions with the environment.

Another AHDB grant has been awarded to fund a PhD studentship supervised by computer scientist Dr Michael Mangan, whose work focuses on modelling the navigational behaviour of insects and developing intelligent 'bio-inspired' robotics system that mimic those behaviours. Dr Mangan's new project will build on his previous work examining exactly how insects use vision to navigate in complex habitats.

He said: "The eyes of insects see the world very differently to the way that human eyes do. For example insects can perceive UV light which humans cannot, and this might be the secret of how these pests pinpoint ripening fruits. As part of this new study, we will develop camera systems to mimic the vision of spotted-wing drosophilia and explore whether or not it is possible to stop the pests from 'seeing' ripening fruit, just by changing the light conditions in which they grow."

The project will develop UV cameras that 'see' in exactly the same way that the insects do, so that the researchers can understand what changes are needed to obscure ripening fruit from view. The research will be carried out in collaboration with industry partner Berry Gardens, the UK's leading berry and stone fruit production group, and trials will eventually be carried out in advanced polytunnels at the University of Lincoln's Riseholme Campus where the Lincoln Institute for Agri-food Technology is based.

The researchers also aim to combine this computer vision work with other ongoing projects at Lincoln that are developing automated harvesting capabilities for the agricultural industries.

The two new projects at the University of Lincoln are funded by the AHDB's PhD Studentship programme. The programme forms a critical part of the Board's ongoing work to support the agricultural and horticultural sectors by ensuring a fresh stock of talented young professionals is encouraged into the industry. The AHDB has awarded £70,500 per studentship, which can be split over three or four years.

AHDB Knowledge Exchange Manager Scott Raffle said: "AHDB is already heavily involved in a comprehensive research programme which seeks to find a series of complementary methods to tackle *Drosophila suzukii*. Given the nature of this pest, we need to find a variety of management and control techniques.

"The work being done by the University of Lincoln in conjunction with NIAB EMR will further complement our extensive efforts at AHDB and we look forward to following their progress."

Provided by University of Lincoln