



What's Happening in... Ecology & Conservation

Major crop pest carries 'good' virus that protects it against pesticides

A team of researchers from Lancaster Environment Centre and the Institute of Plant Protection (Chinese Academy of Agricultural Sciences) in Beijing have shown that some viruses can be beneficial to their hosts.

Influenza, smallpox and, of course, Ebola, are all prime examples of viruses that can devastate human populations. However, with the development of modern molecular technology and the discovery of new microbes, it is now becoming clear that not all viruses are bad.

Prof Ken Wilson and Dr Rob Graham from Lancaster Environment Centre, together with Chinese scientists Prof Kongming Wu and Dr Pengjun Xu, have been studying the cotton bollworm moth, a global insect crop pest, and have recently published a paper¹ showing that caterpillars carrying the virus HaDENV-1 are both healthier and more resistant to pesticides.

The cotton bollworm is one of the most damaging pests throughout Africa, Asia, Europe and Australia. To combat this voracious caterpillar, a number of biological control approaches have been developed, including other microbes and several genetically modified crops that produce lethal toxins. These methods have become widespread and have proved successful in reducing pest outbreaks on cotton, an extremely important cash crop. This new study, however, reveals that these controls are now being undermined by HaDENV-1.

Surprisingly, rather than being deadly, the new virus seems to make the bollworms healthier. Caterpillars carrying HaDENV-1 are heavier, fatter and develop at a faster rate, and adult females produce more offspring and live longer lives. With such positive effects on the bollworms, the team predicted that the virus would be widespread throughout the population. Sure enough, when they collected caterpillars from field populations in China, they discovered that around three-quarters carried the virus.

Professor Wilson said: "The fact that not all bollworms were infected suggested that there must also be a down-side to carrying HaDENV-1. One possibility was that those caterpillars carrying the beneficial microbe might be more susceptible to another, more lethal, microbe - so we conducted laboratory tests to see how they responded to two commonly used biological biopesticides." Once again, the team were surprised by what they found. Rather than being more susceptible to the biological pesticides, they found that HaDENV-1-carrying caterpillars were more resistant to them.

So far, the scientists cannot explain the lack of any obvious cost to carrying HaDENV-1. One possibility, according to Professor Wu, "is that virus-carrying caterpillars are less competitive, less mobile, or are more susceptible to natural enemies or insecticides than those that are virus-free. At the moment we simply don't know and we need to do more research."



Cotton bollworm caterpillar feeding on a flowering cotton plant. (Image credits: Dr Yanhui Lu & Prof Kongming Wu).



¹ Xu P, Liu Y, Graham RI, Wilson K & Wu K (2014) Densovirus is a mutualistic symbiont of a global crop pest (*Helicoverpa armigera*) and protects against a baculovirus and Bt biopesticide. *PLoS Pathogens*.

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