New clue to combating fumigant resistance in insects

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New research, published today in prestigious journal *Science*, has identified the gene responsible for an insect ' s resistance to a major fumigant used by Australia ' s grain industry for insect free grain.

A collaborative effort of scientists from The University of Queensland and the Queensland Department of Agriculture, Fisheries and Forestry Queensland (DAFFQ) supported by the CRC for National Plant Biosecurity has made the discovery that will allow farmers and grain handlers to more effectively manage this problem.

First author of the study Dr David Schlipalius, a scientist at UQ ' s School of Biological Sciences and DAFFQ said problem insects could now be detected even before an outbreak of resistance occurred.

" Phosphine fumigation is the most effective and flexible means of controlling pest infestations during grain storage and handling, " Dr Schlipalius said.

" It is by far the most common treatment for grain and other commodities worldwide because it is cheap, can be used on many commodities and doesn ' t leave toxic residues. "

Dr Schlipalius said prolonging the effective life and availability of phosphine was in the interests of the global grain industry and the world ' s food security.

Dr Paul Ebert, from UQ ' s School of Biological Sciences, said resistance occurs when genetic variants among the original pest insects survive phosphine fumigation and reproduce, generating a population of resistant offspring.

" The discovery of the resistance gene is the first step in identifying ways in which the resistant insects are also vulnerable – their Achilles heel, so to speak, " Dr Ebert said.

Instrumental in tracking down the resistance gene was work performed on the model organism, Caenorhabditis elegans (C. elegans) commonly known as nematode roundworms, led by Dr Massimo Hilliard and Dr. Nick Valmas at UQ's Queensland Brain Institute.

" The discovered gene was indeed able to confer resistance in several species of insects and in nematodes, which indicated its importance across evolution " , said Dr Valmas

Dr Horst Schirra, from UQ ' s Centre for Advanced Imaging, said the study also helped shed light on how resistance affects the metabolism of roundworms and insects.

" This allows us to better understand how resistance develops and will provide insights into possibilities for new fumigants, or treatments that may block the resistance, " Dr Schirra said.

Dr Pat Collins from DAFFQ said in some parts of the world, losses in storage due to grain insect pests alone could be as much as 20 per cent.

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“Losses in India amount to about 20 million tonnes of grain per year, which is equal to more than half of Australia’s total production,” Dr Collins said.

“Phosphine resistance would be a disaster for those countries that rely on it heavily – and that includes Australia, where 80 per cent of our cereal grains are treated by phosphine fumigation.

“It would mean the introduction of much less effective and more expensive treatments, significantly increasing the price and reducing availability of grain,” said Dr Collins.

The research involved scientists at DAFF Queensland, UQ School of Biological Sciences, the CRC for National Plant Biosecurity, The Queensland Brain Institute (QBI) and the UQ Centre for Advanced Imaging.

Funding was received from the Queensland State Government to support the QNN 900MHz, high resolution nuclear magnetic resonance facility at the Centre for Advanced Imaging.

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