Scholarship available for a PhD project in Plant Virology at the University of Western Australia

PhD project: “Wind spread of plant viral pathogens into northern Australia”

This project will provide ideal opportunities for obtaining advanced training in genomics and plant virology. We are seeking a highly motivated student to investigate this exciting project on establishing the extent and significance of viruses with wind-borne insect vectors arriving from nearby countries and establishing in northern Australia. This project will provide ideal opportunities for obtaining advanced training in genomics and plant virology. The hypothesis being tested is that economically important plant viral pathogens of agricultural and horticultural crops or natural ecosystems are arriving in Australia via wind-borne insect virus vectors blown across the sea from Indonesia/East Timor/Papua New Guinea by prevailing wind currents. The connectivity between isolates of the same virus from East Timor or from Northern Australia will be investigated to provide evidence for this hypothesis, and document the occurrence in crops of our Northern neighbours of additional damaging viruses that have not yet reached Australia.

This project will be the first ever investigation to provide solid research data regarding the within-species relatedness (i.e. connectivity) between pathogens or pests found affecting the crops of our northern neighbours and those of Australia itself. The simplicity of virus genomes and the recent advent of deep sequencing technology make such a study feasible, and a suitable subject for a PhD investigation. The project will use the latest, cutting edge deep sequencing technologies and state of the art virus characterisation technologies. UWA will provide state of the art virus characterisation technologies. DAFWA will provide its unique capacity for rigorous large-scale field data collection in northern Australia and sample processing. CSIRO will provide its world-class capability in genomics and bioinformatics, in addition to spatial informatics tools delivered through the Atlas of Living Australia infrastructure.

The Plant Biosecurity Cooperative Research Centre is offering an annual stipend of $30,000 a year tax-free, plus approximately $13,000 additional support a year towards operating expenses. The duration of the scholarship is three and a half years (maximum). The CRC also supports travel to one conference, attendance at an annual student workshop, and formal professional development. Students must be Australian citizens/permanent residents/members of participating United States or New Zealand Universities. Please check the CRC website for further details at http://www.pbcrc.com.au/education-training/scholarships

 Participating organisations

- University of Western Australia (UWA)
- Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Department of Agriculture and Food Western Australia (DAFWA)

 Supervisors

- Prof Roger Jones, Plant Virologist, UWA
- Dr Owain Edwards, CSIRO
- Ms Brenda Coutts, DAFWA

 Background:

This project arises because of (i) the threat to Australian agricultural and horticultural crops, and to its natural ecosystems posed by arrival of damaging new pests and pathogens via wind currents coming from Indonesia/East Timor/PNG, and (ii) the increasing occurrence and intensity of such wind currents likely to occur as a consequence of global climate change. Evidence that virus arrival
by this means has already occurred comes from the Ord River Irrigation Area (ORIA) where genome analysis of aphid-borne Zucchini yellow mosaic virus (ZYMV) revealed that this is the only place in Australia where the southeast Asian ZYMV strain occurs (Coutts et al. 2011, Arch. Virol. 156, 2119-2131). This ZYMV strain would have arrived in the ORIA via viruliferous aphids carried on wind currents. The prevailing winds arriving in the ORIA are from Timor. The parts of northern Australia being considered in this project are the ORIA and the Darwin/Katherine agricultural regions, both of which are remote and extremely isolated from other agricultural regions in Australia. The part of southeast Asia being considered is East Timor as this is where the prevailing winds from southeast Asia that reach the ORIA and Darwin/Katherine come from.

The virus groups of greatest concern for tropical and subtropical regions of the world including southeast Asia are potyviruses and luteoviruses (aphid-borne), geminiviruses (whitefly-borne), and tospoviruses (thrips-borne), so these will be the main focus of the project. Moreover, because of their ease of adaptation to new hosts, emerging viruses (especially potyviruses, geminiviruses and tospoviruses) cause about half of all emerging diseases in the world (Anderson et al. 2004, Trends Ecol. Evol. 19, 535-544). As an example of the damage caused by emerging viruses introduced from Australia's north, epidemics caused by the southeast Asian ZYMV strain decrease average annual fruit and vegetable cucurbit yields by >40% overall in the ORIA and severely damage quality. Fruit and vegetable cucurbit production is a mainstay of the local economy, but the industry can barely survive due to severe ZYMV epidemics occurring every year (Coutts et al. 2011, Virus Research 159, 141-160).

Aims:

1. Establish the extent and significance of viruses with wind-borne insect vectors arriving from nearby countries and establishing in northern Australia by investigating the connectivity between virus genomes found in East Timor and two Northern Australian locations.
2. Identify and analyse the genomes of damaging insect vectored crop viruses in East Timor that pose a potential threat to Australian crops should they reach the north of the continent.
3. Obtain biological data that provide information on the likely economic impact on Northern Australian crops of viruses found to have already reached the north of the continent.
4. Provide a PhD student with advanced training in plant virology that is focussed on plant biosecurity issues.

Applicants for this project:

Applicants for this project should expect to gain or hold a first class or high 2A honours degree, or equivalent, in plant biology, preferably with interest in the discipline of plant virology but this is not essential. Applicants must be eligible for admission to the PhD program at The University of Western Australia. Applications should include evidence of qualifications and research experience, together with a curriculum vitae and contact details of two academic referees.

For further information about this project, or to submit an application, contact:

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