

## NEW ZEALAND PLANT PROTECTION SOCIETY / ZESPRI KIWIFRUIT SCHOLARSHIP



### Breeding kiwifruit for resistance to biotic threats

Production of *Actinidia chinensis* (kiwifruit) is a billion-dollar industry in New Zealand that is threatened by various pests and diseases. Armoured scale insects, leafroller insects and a disease caused by the bacterium *Pseudomonas syringae* pv. *actinidiae* (Psa) all cause economic loss to the kiwifruit industry because of the damage they inflict and the market access restrictions imposed if their presence is detected. Examining the available kiwifruit germplasm pool for resistance to the armoured scale insect (*Hemiberlesia lataniae*) was identified as

a promising first step towards introgression of resistance into future kiwifruit cultivars. To integrate resistance alleles into current and future breeding programmes efficiently, robust markers linked to resistance genes need to be identified.

**Casey Flay**, recipient of the NZPPS/Zespri Kiwifruit Scholarship, is a PhD student at Massey University. In the first year of his PhD, Casey studied *H. lataniae* scale resistance markers in a small family of *A. chinensis* var. *chinensis* from breeding populations at the New Zealand Institute of Plant & Food Research. Markers were identified for this population that were associated with phenotype and were validated in a related population. To test these markers in a diverse background, four families made from a cross of wild-sourced material was phenotyped. All the seedlings resulting from crossing resistant parents with a tolerant parents were resistant to *H. lataniae*. However, further work is required to backcross resistant progeny with susceptible parents before marker information can be associated with phenotype. Ongoing work includes studying *H. lataniae* resistance as well as resistance to the brownheaded leafroller (*Ctenopseustis obliquana*) in a large kiwifruit population which is segregating for resistance to both *H. lataniae* and *C. obliquana*. Loci responsible for each type of resistance will be identified and a detailed quantitative trait locus (QTL) map generated. This process will allow markers to be developed to target these QTLs, enabling them to be robust tools for resistance breeding. Casey will also study the effects of Psa on the kiwifruit germplasm collection at Plant & Food Research. Selection mapping will be used to assess alleles that are removed from the germplasm population as a consequence of Psa infection. Results of this work will provide information on the sections of the kiwifruit genome that confer tolerance or susceptibility to Psa, enabling breeders to enhance breeding for resistance to Psa.

Breeding for resistance to biotic threats that are currently targeted by chemical sprays is a reasonable move toward a healthier, cheaper and more environmentally friendly form of food production. This will benefit organic producers and conventional producers alike by reducing market access issues, decreasing the need for pest control, and decreasing the real and perceived risks associated with spray residues, resulting in increased market appeal and economic returns.

This one-off NZPPS/Zespri Kiwifruit Scholarship was possible thanks to Zespri. It was funded by the proceeds of a symposium on Psa held in Palmerston North in 2016 run jointly by Zespri and the New Zealand Plant Protection Society.