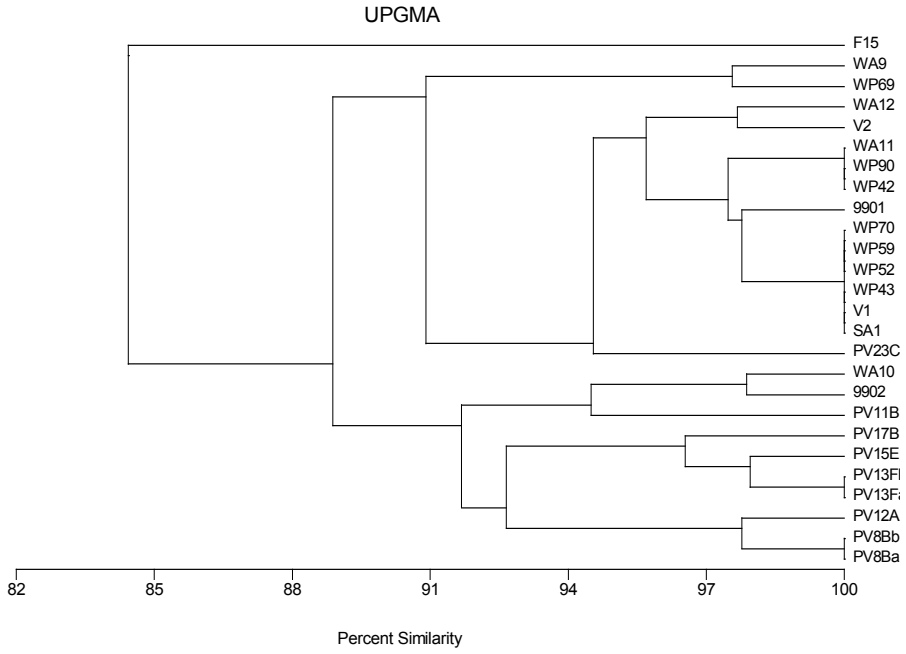
Project 2000-04 Biological control of Blackberry: Executive Summary

***Background*:**
Blackberry interferes with silvicultural activities in New Zealand (NZ); therefore it would be of benefit to the forestry industry if this weed could be brought under control by biological agents. The weed is also a problem in Australia, and in the late 1970s a European rust fungus (*Phragmidium violaceum*) was selected as the most promising biocontrol agent for that country. In both Australia and NZ the common name 'blackberry' is applied to numerous species and hybrids in the genus *Rubus* that differ in their susceptibility to different strains of *P. violaceum*. Host range studies were conducted in Europe to select the most virulent strain of *P. violaceum* for Australia's worst blackberry species. Before this testing was complete, an unknown strain (or strains) of the rust was/were illegally introduced to Australia (first detected in 1984). The officially sanctioned rust strain (F15) was released in Australia in 1991 and 1992. The rust was first recorded on blackberry in NZ in 1990 and it was believed the illegally introduced strain/s had arrived from Australia via wind dispersal of spores across the Tasman Sea. The rust spread across NZ quickly, but disease incidence has been sporadic and uneven. It seemed that blackberry species in NZ varied in susceptibility to the rust and that susceptible species were being replaced by more resistant ones. There is potential to increase the efficacy of biocontrol of blackberry in NZ by importing further strains of the rust, either from Australia, or from Europe. However, before this could happen, it was important to confirm the origin and identity of the NZ strain/s.

***Project aims*:** Collect blackberry rust from a number of sites across NZ, extract rust DNA, and send it to Australia for comparison with the DNA of their rust strains. Project undertaken by Landcare Research (LR).

***Results*:**
Phragmidium violaceum was collected from nine *Rubus* species from 23 sites scattered across both islands of NZ. The process to produce pure genetic lines of each rust strain proved difficult, and as a result DNA from only seven strains could be sent to Australia to be analysed using the 'selectively amplified microsatellite polymorphic loci' (SAMPL) method, which is a modification of AFLP. The Dendrogram (right) shows the percentage similarity between the NZ strains of the rust (labelled PV) and the Australian strains (F15 = legal strain, WA = Western Australia, WP & V = Victoria, 99 & SA = South Australia). The DNA fingerprints of the NZ strains and the Australian strains were very similar. Only strain 23C (from southland, the southernmost NZ collection) clustered with the majority of Australian isolates. The other NZ strains were closely related to two Australian isolates. They show a pattern of genetic variation that is consistent with either multiple introductions from Australia, or diversification following establishment in NZ. The legal strain, F15, is rare in Australia and was not collected in NZ.



***Conclusions*:**
1) It is highly likely that the strains of *P. violaceum* that occur in NZ originated from descendents of strains released illegally in Australia;
2) 2) Strain F15 and its descendents are rare in Australia and probably haven't reached NZ yet; and
3) 3) NZ could import strain F15, but the *Rubus* sp. it was most effective against in glasshouse tests doesn't occur in NZ. The Australians have just (April 2004) released eight more strains of *P. violaceum*. To improve biocontrol of blackberry in NZ one could: find out which *Rubus* sp. are susceptible to these new strains, and decide whether to seek permission to import potentially useful strains; or, wait for them to cross the Tasman on their own (the latter is likely to take ca. six years). Alternatively, the host range of strain PV23C could be tested, and if it were shown to attack more, or more important, *Rubus* sp. than the other NZ strains, it could be deliberately spread. As a result of this project, we know the likely origin and identity of the NZ strains and can make informed choices.

***Acknowledgements*:**
Shaun Pennycook (LR) collected the rust; Paula Wilkie (LR) 'bulked up' the rust; Duckchul Park (LR) extracted the

Rust DNA; Don Gomez (CRC Australian Weed Management) performed the SAMPL analysis; Kathy Evans (Weeds CRC, now at TIAR, University of Tasmania) managed the work in Australia; and David Glenny (LR) identified the *Rubus* sp. This research was funded by the Forest Health Research Collaborative and EBOP. The project was managed, and this summary written (in May 2004), by Jane Barton, contractor to LR.

This work has since been published:

Gomez, D.R., Evans, K.J., Harvey, P.R., Baker, J., Barton, J., Jourdan, M., Morin, L., Pennycook, S.R., Scott, E.S., 2006. Genetic diversity in the blackberry rust pathogen, *Phragmidium violaceum*, in Europe and Australasia as revealed by analysis of SAMPL. Mycological Research 110, 423-430.