Rhizobial diversity in New Zealand legumes

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Abstract

Utilising inferred phylogenies from gene sequence data it is shown that in New Zealand different genera of rhizobial populations nodulate native legumes, and exotic invasive weeds. The diversity of strains discovered contrasts with previous studies implying host legume specificity. The host range of Rhizobium leguminosarum is extended by the observation that it nodulates native New Zealand woody legumes.

Introduction

New Zealand has four genera of native legumes: Sophora, Clarnicha, C. Clarnithus and Montigena. Several exotic legumes (gorse, broom, Acacia) have reached “super weed” status covering millions of hectares, and costing tens of millions of dollars per year to control. Their success is due to, in part, their rhizobial symbioses.

New Zealand, as an island, has been separated from the regions of major legume evolution for about 80 million years, yet exotic legumes were introduced less than 200 years ago by early European settlers.

Methods

- 36 bacterial isolates were obtained from the root nodules of 9 native and 5 introduced weed legume species from throughout the country.
- 5 type strains of rhizobial species were isolated to complement GenBank gene sequence data.
- Four genes (16S rDNA, glnII, recA, pSymA) PCR amplified and sequenced for 36 NZ strains and 5 type strains.
- Phylogenetic trees were built for each gene type strains from different rhizobial species.

Result

The phylogenetic trees produced were mostly congruent (only 16S rDNA shown here).

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It is clear that native legumes and exotic legumes are nodulated by totally different rhizobial populations: Native legumes are nodulated by diverse Mesorhizobium populations and by Rhizobium leguminosarum, whilst introduced legumes are nodulated by diverse Bradyrhizobium spp.

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