

Do soil microbes drive *Acacia* species invasion in non-native ranges in Australia?

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Summary Across Australian states, acacias became invasive or even naturalised after being introduced to ecosystems outside their natural distribution range. The relative importance of soil biota in their invasion success remains unknown, particularly that of rhizobial and fungal communities. We examined the role of soil biota on the invasion success of four *Acacia* spp. (*A. cyclops* A.Cunn. ex G.Don, *A. longifolia* (Andrews) Willd., *A. melanoxylon* R.Br. and *A. saligna* (Labill.) H.L.Wendl.) and the closely-related *Paraserianthes lophantha* (Willd.) I.C.Nielsen in Australia. Samples were collected from five native and five non-native populations of each species in four states (i.e. New South Wales, Victoria, South Australia and Western Australia).

We used a plant-soil feedback experiment to measure the net effect of beneficial and detrimental soil microbiota on plant performance. In addition, we used 454 sequencing to identify the nitrogen-fixing

bacterial and fungal communities in nodules and soil. The plant-soil feedback experiment showed that soil origin had no effect on the performance of these five host species in their non-native range soils. However, seed origin influenced the performance of two species, i.e. *A. cyclops* and *A. saligna*. Overall, 454 sequencing results revealed that geographic location had an effect on fungal, but not on rhizobial composition. Rhizobial and mainly fungal composition of *A. cyclops* were significantly different from other four host species suggesting that this species encounters and plausibly associates with different soil microbiota compared to other acacias.

In conclusion, our results suggest that soil biota is unlikely to have impacted the invasion success of these five species in Australia.

Keywords Australia, invasion, fungi, legumes, plant-soil feedback, rhizobia.