Inhibitory effects of eucalyptus globulus on understorey plant growth and species richness are greater in non-native regions

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Abstract

Aim

We studied the novel weapons hypothesis in the context of the broadly distributed tree species Eucalyptus globulus . We evaluated the hypothesis that this Australian species would produce stronger inhibitory effects on species from its non-native range than on species from its native range.

Location

We worked in four countries where this species is exotic (U.S.A., Chile, India, Portugal) and one country where it is native (Australia). Time period 2009–2012. Major taxa studied Plants.

Methods

We compared species composition, richness and height of plant communities in 20 paired plots underneath E. globulus individuals and open areas in two sites within its native range and each non-native region. We also compared effects of litter leachates of E. globulus on root growth of seedlings in species from Australia, Chile, the U.S.A. and India.

Results

In all sites and countries, the plant community under E. globulus canopies had lower species richness than did the plant community in open areas. However, the reduction was much greater in the non-native ranges: species richness declined by an average of 51% in the eight non-native sites versus 8% in the two native Australian sites. The root growth of 15 out of 21 species from the non-native range were highly suppressed by E. globulus litter leachates, whereas the effect of litter leachate varied from facilitation to suppression for six species native to Australia. The mean reduction in root growth for Australian plants was significantly lower than for plants from the U.S.A., Chile and India.

Main conclusions

Our results show biogeographical differences in the impact of an exotic species on understorey plant communities. Consistent with the novel weapons hypothesis, our findings suggest that different adaptations of species from the native and non-native ranges

to biochemical compounds produced by an exotic species may play a role in these biogeographical differences.

Keywords

Allelopathy, Biological invasión, Eucalyptus globulus, Leachates, Novel weapons hypothesis, Plant–plant interactions.