Resident community species diversity decreases the fitness of an invasive annual grass

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Species Diversity-Invasibility

Kennedy et al. Nature 2002
Species Diversity-Invasibility
Species Diversity-Invasibility

Increased resource use
Species Diversity-Invasibility

Increased resource use
Presence of a good competitor
Genetic Diversity-Invasibility

Crutsinger et al. Science 2006
Genetic Diversity-Invasibility
Genetic Diversity-Invasibility
1. Increasing the species diversity of a resident plant community will decrease invasive population success.

2. Increasing the genetic diversity of an invasive plant population will increase invasive population success.
Study System
Avena barbata
Assembled Communities that differed in Species Diversity (1-16)
Experimental Design

Invaded communities with Avena barbata populations that differed in genetic diversity (1, 2, 4, 8)
Avena Survival
Avena Seed Production
Community Productivity

Relative abundance of all 16 native species in each plot
Measured Response variables:
  Avena Survival
  Avena Seed Production
  Community Productivity
  Resource Availability

Were predicted by manipulated variables:
  Realized species richness (1-16)
  Avena genotypic richness (1, 2, 4, 8)
  Relative abundance of all 16 native species
Analysis – ANCOVA model

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  Realized species richness
  Avena genotypic richness (1, 2, 4, 8)
  Relative abundance of all 16 native species
Avena survival not influenced by resident species diversity

\[ F_{1,287} = 0.37, p > .05 \]
Avena seed production decreased with species diversity

$F_{1,159} = 8.65, p < .01$
Community productivity increased with species diversity

$F_{1,288} = 18.87, p < .0001$
Light availability decreased with species diversity

$F_{1,288} = 108.90, p < .0001$
Avena seed production decreased with abundance of poppies

$F_{1,159} = 5.02, \ p < .05$
Increasing species diversity of a resident plant community did not affect *Avena* survival but did decrease seed production.

- Increasing community productivity
- Decreasing light availability
- Presence of *Eschscholzia californica*
Avena survival not influenced by genetic diversity

$F_{1,287} = 0.67, p > .05$
Avena seed production not influenced by genetic diversity

\[ F_{1,159} = 3.18, \ p > .05 \]
Avena genotypes differed in seed production

\[ F_{1,159} = 5.03, \ p < .05 \]
Summary – Hypothesis 2

Increasing genetic diversity of invasive *Avena* populations did not affect *Avena* survival or seed production.

However, individual seed production differed between genotypes regardless of diversity.
Conclusions

• Abiotic factors may be more important for establishment and survival but biotic factors are important for fitness

• During a single generation species diversity is more important than genetic diversity for invasive success.

• Over time, selection may act to increase the number of highly productive invasive genotypes
• Conserve native species diversity
• Restore California grasslands with a diverse mix of species
• Focus eradication efforts on the most productive invasive individuals
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