Effects of a putative floral pathogen on the reproductive fitness of native and introduced grasses on a California coastal prairie
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Introduction
Most of the common native and introduced grasses on the California coastal prairie of Bodega Marine Reserve show disease symptoms consistent with infection by a generalist floral pathogen. Previous work with the introduced annual Bromus diandrus and the native perennial B. carinatus demonstrated that apparently less infected inflorescences yielded seeds with significantly higher mass that germinated more rapidly (Huerta de Garcia and Alpert, unpublished data). If the apparent disease reduces reproductive fitness and affects different species to different extents, then it could play a role in shaping community structure. If the apparent disease has stronger effects on native than introduced species, or vice versa, then it could be mediating invasion dynamics in the grassland.

Research Questions:
1) What are the effects of the apparent disease on plant fitness as measured by seed size, germination, and seedling growth?
2) Does the apparent disease affect native and introduced species differently?

Methods
Seeds were collected on the Bodega Marine Reserve during June and July 2005 and were after-ripened in the lab for one year. Inflorescences were classified in the field into three symptom levels (low, moderate, high) based on color, appearance, and the presence or absence of epiphytic fungi on the glumes and lemmas of the inflorescences. The eight species used include three of the five most abundant native perennial bunchgrasses on the reserve and four of the six most abundant introduced annuals. For some species, inflorescences with low symptom levels were not found in 2000.
• 48 seeds of each available symptom level were selected for each species. (BC, EG, HB, BM, BD, HM, LM, VB)
• Once the number of new seeds germinating was very low, the length of the longest leaf on each seedling was measured.

Results
For all three native and three of the five introduced species, seeds from inflorescences with a high symptom level were lighter in mass, shorter, or had a lower mass to length ratio than seeds from inflorescences with moderate or low symptom levels.

Discussion
Seed provisioning is an important factor in seed survival and early seedling competition. For the majority of the species in this study, seed mass, length, and mass to length ratio were related to symptom level, with seeds that showed higher symptom levels being smaller. The magnitude of this effect varied across species, and reduced seed size appeared to cause reduced seedling growth. For two introduced species, time to germination was longer in the moderate and high symptom levels than in the low. These species also had a reduced seed mass to length ratio for the high symptom level, indicating that seed size may also play a role in germination.

There was not a clear difference in the effects of this apparent disease on native and introduced species, but this does not mean that the disease is not mediating invasion dynamics. On the Bodega Marine Reserve all native grasses are perennials and most introduced species are annuals. Consequently, a disease that affects the fitness of all species equally would put perennials, and therefore mostly natives, at an advantage in competition with introduced annuals, because perennials do not depend as much on the soil seed bank for persistence. It may be that this apparent disease affects seed production, so that high symptom level inflorescences produce fewer seeds than low symptom level inflorescences.

Further Questions
1) How does this potential disease affect or shape grassland community structure?
2) Could this apparent disease be responsible for coastal grasslands in California retaining a large proportion of native grasses relative to inland grasslands?
3) What is the pathology of this disease and what is the extent of its spread in California grasslands? How is it influenced by environmental conditions?

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