CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S1615

Project Title
Impact of Elevated CO(2) Atmosphere on Germination of Jasper Ridge Plants

Abstract

Objectives/Goals
One component of Global Warming is the influence of green house gasses such as CO2. In order to better understand the potential effect on flora, I evaluated the impact of elevated CO2 on the germination of native California plants to assess their capacity to adapt to increasing concentrations of atmospheric CO2.

Methods/Materials
19 species (17 Jasper Ridge indigenous, 1 invader, 1 control) were tested in 6 greenhouse-based ecosystems alternating 3 elevated CO2 (700ppm) and 3 ambient air (350ppm). 450 chambers/flat/ecosystem were planted with 36 seeds/species/flat. 3 replicates were completed. Germination date, total germination, average germination/day, 50% germination day, and germination peak were determined. Mean, standard deviation, standard error and T-test to 5% were calculated.

Results
All 9 species that tested to 5% error demonstrated a change in germination pattern in elevated CO2. 4 species, Avena fatua, Bromus diandrus, Elymus glaucus, and Nassella pulchra, germinated more plants and 5 species, Bromus hordeaceus, Lolium multiflorum, Arabidopsis thaliana, Brachypodium distachyon, and Vulpia bromoides, germinated fewer plants. Additionally, 3 species, Elymus glaucus, Nassella pulchra, and Arabidopsis thaliana germinated at a statistically significantly slower rate in elevated CO2 than their ambient air counterparts.

Conclusions/Discussion
Atmospheric concentrations of CO2 are expected to rise significantly, potentially doubling, in the next 50 years. Studying CO2's effect on the ecosystem is crucial to understanding the environment's future. As there are feedbacks between the plant-soil system and the atmosphere, knowing how plants respond to the atmosphere tells us something about how the atmosphere, and associated factors like rainfall and temperature, will appear in the future. Additionally, as plants are the base of the food chain, changes in plant growth could also translate to alterations in organisms at other tropic levels.
Elevated CO2 does appear to impact the germination of native California plants. The specific effect on growth quantity and rate was unique to each species tested. These results suggest that elevated atmospheric CO2 could cause changes in native California flora communities by modifying each species' competitive germination advantage or disadvantage. Should this be the case, the effects of elevated CO2 on vegetation could be an important concern of Global Warming.

Summary Statement
The project's purpose was to study if CO2, a component of Global Warming, will affect the germination of native Californian plants.

Help Received
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