

Elevated CO₂ levels, biodiversity, and weeds

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Carbon dioxide (CO₂) levels are increasing much faster today than in any other time in history. Scientists predict that by the year 2100, or earlier, the concentration of CO₂ in the atmosphere will have doubled since pre-Industrial times. This causes great concerns for the future of the Earth including the greenhouse effect, global warming, and direct and indirect effects on plants. Direct effects include increased photosynthesis, productivity, and water use efficiency. C₃ plants tend to respond to elevated CO₂ levels more than C₄ plants, and the response varies with environmental factors. Indirect effects include changes in competitive interactions, fire frequency, herbivory, and rates of litter decomposition. The potential effects reflect plant interactions with other biotic and abiotic factors such as other plants, herbivores, precipitation patterns, and soil nutrients. These factors have important influences on the ways that plants respond to elevated CO₂ levels. Another factor that may influence ecosystem response to increases in CO₂ concentrations is biodiversity. Plants in diverse ecosystems may utilize elevated CO₂ levels better than plants in ecosystems with fewer species. However, elevated CO₂ levels may have an influence on biodiversity of plants. Changes in species distribution and shifts in composition within plant communities are likely and may lead to decreases, or perhaps increases, in biodiversity. In addition, elevated CO₂ levels and associated global change may increase invasive species success ultimately decreasing biodiversity. On the other hand, many weeds are C₄ and most plants and crops are C₃, so if elevated CO₂ levels favor C₃ plants, most plants and crops may be better equipped to compete with weeds in the future. No single answer exists for the question of how plants, plant communities, and entire ecosystems will respond to elevated levels of CO₂ because very many interactions exist and vary from place to place. Plant scientists should be aware of the fact that plant changes due to elevated CO₂ levels may occur.

References

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