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What factors drive the response of an old-field plant community to the interactive effects of $CO_2$, temperature, and soil water availability?

Plant community composition and ecosystem function may be altered by global atmospheric and climate change (atmospheric [$CO_2$], temperature, and precipitation). An ecological experiment at Oak Ridge National Laboratory (ORNL) Environmental Research Park investigates interactive effects of [$CO_2$], temperature, and soil moisture on an old-field plant community. The OCCAM (Old-field Community Climate and Atmospheric Manipulation) project utilizes open-top chambers equipped with rain shelters with experimental plant communities constructed of seven common old-field species, including C3 and C4 grasses, forbs, and legumes. We monitored the cover and morphological characters of individuals within subplots. Initial responses indicate that Plantago lanceolata (C3 herb) responded negatively to increased temperature, and positively to increased soil water availability, although the response appears to be ameliorated by elevated [$CO_2$]. Trifolium pratense (C3 legume) and Solidago canadensis (C3 forb) exhibited increased growth in elevated temperature plots, with very slight positive responses to [$CO_2$]. Andropogon virginicus (C4 grass) responded positively to increased temperature, without a dramatic effect of elevated [$CO_2$]. Responses to varying soil water availability were masked by negligible treatment differentials in the initial stages of the experiment. Species specific responses may be explained by inter- and intraspecific interactions include competitive exclusion. Concurrent examination of plant response to both biotic and abiotic factors facilitates a more complete understanding of how communities may shift with changing abiotic conditions.