Effects of Elevated Atmospheric CO₂ on Tropical Spiderwort


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ABSTRACT

Tropical spiderwort (Cassia obtusifolia L.) is considered an aggressive invasive weed and is increasing the problem of weed infestations in agricultural settings. To alleviate the effects of global change on the invasive species, it will be important to study how tropical spiderwort will react to increased CO₂. The objective of this research project is to generate information to help combat tropical spiderwort in a future high CO₂ environment. A series of competition studies may use the following pairs: (1) tropical spiderwort and the pasture species (herbicides to be determined) at the twice the highest labeled rate, as well as full, one-half, and one-quarter labeled rates. The ability to assess competition studies will not be a reliable indicator of invasion potential, as future invasion may be possible with high CO₂ enrichment with emphasis on roots and the rhizosphere.

INTRODUCTION


GOALS AND METHODS

In the first phase, tropical spiderwort will be assessed for its response to increased CO₂. Based on its initial findings from the first and second phases, the third phase will be a series of competition studies conducted under enhanced CO₂ conditions (Rogers et al., 1983).

REFERENCES


USDA-APHIS

Photographer, Andrew Price, USDA-ARS-NSDL

Photographer, Stanley Culpepper, The University of Georgia

HYPOTHESES AND RESEARCH GOALS

The objective of this research project is to determine how tropical spiderwort (Cassia obtusifolia L.) will respond to increased CO₂. Tropical spiderwort will be grown under ambient and twice ambient CO₂ concentrations. Tropical spiderwort will be grown under ambient and twice ambient CO₂ concentrations.

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Hypothesis 1: Elevated atmospheric CO₂ will result in positive growth responses of tropical spiderwort. Hypothesis 2: Increased atmospheric CO₂ will increase the competitive ability of tropical spiderwort with other plant species. Hypothesis 3: Increased atmospheric CO₂ will increase the parthenocarpic flower production of tropical spiderwort. Hypothesis 4: Increased atmospheric CO₂ will increase the carbon assimilation of tropical spiderwort. Hypothesis 5: Increased atmospheric CO₂ will increase the water use efficiency of tropical spiderwort. Hypothesis 6: Increased atmospheric CO₂ will increase the biomass of tropical spiderwort. Hypothesis 7: Increased atmospheric CO₂ will increase the NO₃⁻ uptake of tropical spiderwort. Hypothesis 8: Increased atmospheric CO₂ will increase the N content of tropical spiderwort. Hypothesis 9: Increased atmospheric CO₂ will increase the C/N ratio of tropical spiderwort. Hypothesis 10: Increased atmospheric CO₂ will increase the leaf area of tropical spiderwort. Hypothesis 11: Increased atmospheric CO₂ will increase the stem length of tropical spiderwort. Hypothesis 12: Increased atmospheric CO₂ will increase the leaf area ratio of tropical spiderwort. Hypothesis 13: Increased atmospheric CO₂ will increase the leaf area index of tropical spiderwort. Hypothesis 14: Increased atmospheric CO₂ will increase the total leaf number of tropical spiderwort. Hypothesis 15: Increased atmospheric CO₂ will increase the total flower number of tropical spiderwort. Hypothesis 16: Increased atmospheric CO₂ will increase the total aboveground biomass of tropical spiderwort. Hypothesis 17: Increased atmospheric CO₂ will increase the root biomass of tropical spiderwort. Hypothesis 18: Increased atmospheric CO₂ will increase the total root length of tropical spiderwort. Hypothesis 19: Increased atmospheric CO₂ will increase the root mass of tropical spiderwort. Hypothesis 20: Increased atmospheric CO₂ will increase the root/shoot ratio of tropical spiderwort. Hypothesis 21: Increased atmospheric CO₂ will increase the leaf senescence of tropical spiderwort. Hypothesis 22: Increased atmospheric CO₂ will increase the leaf color of tropical spiderwort. Hypothesis 23: Increased atmospheric CO₂ will increase the leaf thickness of tropical spiderwort. Hypothesis 24: Increased atmospheric CO₂ will increase the leaf dry mass of tropical spiderwort. Hypothesis 25: Increased atmospheric CO₂ will increase the leaf water content of tropical spiderwort. Hypothesis 26: Increased atmospheric CO₂ will increase the leaf water potential of tropical spiderwort. Hypothesis 27: Increased atmospheric CO₂ will increase the leaf specific leaf area of tropical spiderwort. Hypothesis 28: Increased atmospheric CO₂ will increase the leaf nitrogen content of tropical spiderwort. Hypothesis 29: Increased atmospheric CO₂ will increase the leaf phosphorus content of tropical spiderwort. Hypothesis 30: Increased atmospheric CO₂ will increase the leaf potassium content of tropical spiderwort. Hypothesis 31: Increased atmospheric CO₂ will increase the leaf calcium content of tropical spiderwort. Hypothesis 32: Increased atmospheric CO₂ will increase the leaf magnesium content of tropical spiderwort. Hypothesis 33: Increased atmospheric CO₂ will increase the leaf iron content of tropical spiderwort. Hypothesis 34: Increased atmospheric CO₂ will increase the leaf manganese content of tropical spiderwort. Hypothesis 35: Increased atmospheric CO₂ will increase the leaf copper content of tropical spiderwort. Hypothesis 36: Increased atmospheric CO₂ will increase the leaf zinc content of tropical spiderwort. Hypothesis 37: Increased atmospheric CO₂ will increase the leaf boron content of tropical spiderwort. Hypothesis 38: Increased atmospheric CO₂ will increase the leaf silicon content of tropical spiderwort. Hypothesis 39: Increased atmospheric CO₂ will increase the leaf sulfur content of tropical spiderwort. Hypothesis 40: Increased atmospheric CO₂ will increase the leaf sulfur content of tropical spiderwort.