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Rising CO₂ and Temperature Effects on Potato Crops



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The humble potato is our third most important food crop, providing us complex carbohydrates, vitamins, and essential minerals¹. As such, potatoes will continue to be a major food crop into the future. Climate change is affecting regional potato productivity and in some areas is an emerging threat to yield security from high temperatures and drought^{2,3}. Predicting the future is never easy, but predicting future changes to regional climates is especially challenging. Increased CO₂ concentrations generally stimulate potato yields and the associated mild temperature increases may too have a stimulatory effect on the growth and yield of harvestable potatoes^{3,4}. In cold-temperate potato growing regions such as Michigan that have access to reliable irrigation, or that are predicted to become wetter, elevated CO₂ concentrations and temperatures may increase potato yields. The timing of elevated temperatures within the growing season however, may be the most important factor for determining climate change impacts on potato yield. Moreover, how elevated CO₂ concentrations and temperatures affect potato tuber quality are unclear.

Professor Courtney Leisner and her colleagues have confronted this challenge head on with the help of their BioChambers⁵. Practically limitless schedule lines allowed her to re-create the within season variation in temperatures over the entire potato growing season for different future climate projections. These projections varied in their timing of the largest projected temperature changes during the growing season. Robust CO₂ control allowed her to grow plants under projected mid-century CO₂ concentrations, capturing the environmental conditions irrigated potatoes may experience in the future. Professor Leisner and others found that in the future, the fertilizing effects of elevated CO₂ concentrations may increase the growth and yield of potatoes (harvestable tuber weight), despite some reduction in above-ground growth. Unfortunately, Professor Leisner and others also observed reduced potato quality, measured as a reduction in the specific gravity, under future climate projections. A high specific gravity is especially important for making potato chips to ensure low oil content and high chip yield. So, despite greater potential yields, new cultivars may be required that maintain high specific gravity under future elevated temperatures and CO₂ concentrations, posing a challenge to breeders and others involved in cultivar improvement⁵.



References

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