

[P2] Farming System

Thu. Sep 9, 2021 12:15 PM - 2:00 PM Room 2 (Poster) (Farming System)

1:15 PM - 2:00 PM

[P2-04] Nitrogen and Water Demands for Maximum Growth of *Solanum tuberosum* under Doubled CO₂: Interaction with Phosphorus Based on the Demands

*Nominated for Presentation Awards

○Yan Yi, Daisuke Sugiura, Katsuya Yano (Graduate School of Bioagricultural Sciences, Nagoya University, Japan)

Crop growth promotion utilizing elevated carbon dioxide concentrations (e[CO₂]) may be limited by soil nutrient availability. Although numerous studies have suggested the importance of nitrogen (N) for the promotion of growth under e[CO₂], N requirement for maximum growth is rarely examined. We have found that increase in potato (*Solanum tuberosum* L.) biomass depends on phosphorus (P) under e[CO₂]. To address whether the N requirement for maximum growth under e[CO₂] is dependent on P or not, we quantified potato growth and water consumption in response to five N supply rates at low P (LP) and high P (HP). A pot experiment was conducted in controlled-environment chambers with ambient [CO₂] (a[CO₂]) and e[CO₂]. Foliar critical N concentration per area (critical [N]area), the minimum N requirement for 90% maximum plant growth, was similar (1.43 g N m⁻²) regardless of [CO₂] under LP. Under HP, however, the critical [N]area increased under e[CO₂] (1.65 g N m⁻²) compared with a[CO₂] (1.52 g N m⁻²). Water use did not change with e[CO₂] under HP, whereas it decreased with e[CO₂] under LP despite the increase in biomass owing to higher water-use efficiency (WUE). Although WUE with e[CO₂] or HP was independent of N supply, biomass increment with e[CO₂] or HP depended on N supply. We concluded that N and water required by potato plants under e[CO₂] would be dependent on P supply. Although under HP, e[CO₂] increased N but not water required to obtain maximum growth, N demand was unchanged and water demand decreased by e[CO₂] under LP, probably owing to growth limited by P availability.