Enhancing Nitrogen Use Efficiency and Stress Tolerance of Perennial Ryegrass by Concentrating Nitrate Assimilation in Roots. (C05-bushoven130823-Oral)

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Abstract:

Perennial ryegrass assimilates soil-derived nitrate-N predominately in leaves. C and N assimilation are highly coordinated and the location of the latter can significantly impact the partitioning of photosynthate. Root retention and growth under unfavorable environmental conditions are dependent on photosynthate transport from the leaf. Increasing the nitrate assimilation potential (NAP) of roots may increase photosynthate translocation and subsequently increase root mass. The objective of this study was to determine if root nitrate absorption is in excess of root capacity for nitrate assimilation. NAP in intact tissues and crude enzyme extracts, and tissue nitrate concentrations were determined in 'Palmer III' perennial ryegrass exposed to various nitrate concentrations (0.14-14 ppm). Root NAP remained low and was independent of nitrate concentration indicating that even at the lowest nitrate concentration, most nitrate was transported to leaves. Nitrate transport to leaves is dependent on co-transport with potassium; and by limiting potassium availability, root NAP was significantly increased suggesting that enhancing root NAP may be possible by limiting xylem nitrate transport.

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