Effects of Mycorrhizae on Struvite Dissolution
Can plant-fungus mutualism increase the viability of a sustainable phosphorus fertilizer?

Isako Battista Di Tomassi,1 Neha Chatterjee,2 Erinn Dady,3 and Andrew Margenot2

1Community College of Philadelphia, Philadelphia, Pennsylvania
2Department of Crop Sciences, College of ACES, University of Illinois at Urbana-Champaign
3Parkland College, Champaign, Illinois

Project Goal
To determine effect of arbuscular mycorrhizal fungi (AMF) on struvite dissolution, as well as the effect of struvite, and its placement, on mycorrhizal colonization and plant phosphorus uptake.

Background
- Phosphorus (P) is essential for all organisms
- In agriculture, P, nitrogen (N) and potassium (K) are applied in large amounts as fertilizer
- Monoammonium phosphate (MAP), a conventional fertilizer, is highly water soluble, causing high P and N concentrations in agricultural runoff, harming aquatic life
- Struvite (NH₄MgPO₄·6H₂O), a waste-water derived product with potential for use as a P fertilizer; has low water solubility
- Phosphorus in struvite is not as accessible to plants as it is in MAP
- Arbuscular mycorrhizal fungi (AMF) form mutualisms in which they receive carbon from plants in exchange for other nutrients
- AMF assist in P uptake by more thorough soil exploration, a higher P affinity than that of plant roots, modification of the rhizosphere through exudates, and hyphal storage of absorbed P

AMF exude organic acids which have been shown to significantly increase solubilization of struvite, which is needed to make P accessible to plants

Experiment Design
- Two Solanum lycopersicum (tomato plant) genotypes used, the wild-type, Myc, and a reduced mycorrhizal colonization mutant-type (referred to as rmc), which has very low rates of AMF association (<1%)
- Pouch of fertilizer has close placement, or further placement, where the plant can not ‘find’ it as easily
- MAP v struvite for the additional question of whether struvite will increase mycorrhizal colonization

Hypotheses
- More struvite will have solubilized in pots with the Myc genotype
- Myc roots will show higher rates of AMF association in pots with struvite treatment than in MAP pots
- The Myc struvite deep placement pots will have higher rates of AMF association as well

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References
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