

May 2020 Investment Insight

Is Struvite a Possible Phosphorus Alternative?

Dr. Andrew Margenot and his team at the University of Illinois are evaluating slow-release phosphorus fertilizers to increase crop production and environmental quality.

Though often proposed as a P fertilizer, struvite has not been sufficiently evaluated in the peer-reviewed scientific literature to enable its use by farmers. This study comprehensively determined the dual agricultural and environmental (P loss risk) outcomes of struvite.

- In soils with deficient Soil Test Phosphorus (STP) **50-50% struvite-MAP blends appear optimum** for maximizing vegetative corn and soybean growth while **minimizing residual Soil Test Phosphorus (STP) by up to -18%**. This indicates lower Dissolved Reactive Phosphorus (DRP) loss risk from surface soils via runoff without compromised crop growth (**Figure 1**).
- In soils with optimum to high Soil Test Phosphorus (STP), **corn yields are unaffected by up to 75% struvite substitution** and yields of double-cropped wheat and soybean are unaffected by up to 100% struvite substitution for MAP. This likely reflects 'banked' P from previous applications, but on the other hand is representative of Soil Test Phosphorus in Illinois production agriculture. (**Figure 2**).
- Timing (fall vs spring) and placement (broadcast vs banding) did not influence corn yield

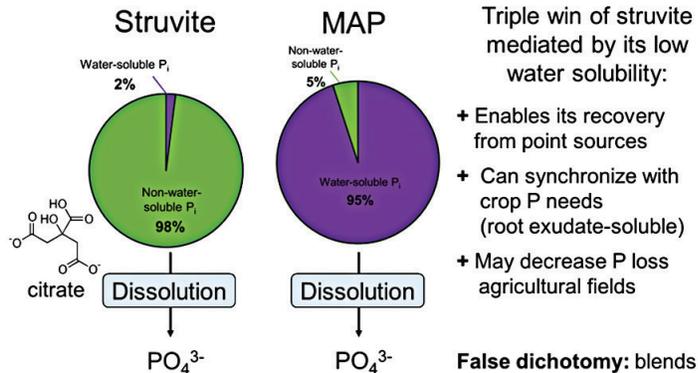


Figure 1. Comparison of struvite with monoammonium phosphate (MAP) and the benefits of struvite for meeting crop production and P loss mitigation goals.

response to struvite-MAP blends in 2019.

- Residual struvite granules remaining in soils at the time of sampling may inflate apparent Soil Test Phosphorus values.
- However, residual granules of struvite present at the end of the growing season are chemically and physically weathered, suggesting that **residual granules are more likely to dissolve than freshly applied struvite in the subsequent season**.
- Arbuscular mycorrhizal associations **can increase solubilization of struvite by up to 40%**, indicating that greater soil health

Triple win of struvite mediated by its low water solubility:

- + Enables its recovery from point sources
- + Can synchronize with crop P needs (root exudate-soluble)
- + May decrease P loss agricultural fields

False dichotomy: blends

promotes solubilization of struvite.

Overall this leads to a triple win for Phosphorus with struvite by decreasing P losses from both point and non-point sources, while maintaining improved profitability.

Struvite could replace a percentage of DAP or MAP as a potential fertilizer for Illinois agriculture and this would make Illinois more self-sufficient in producing Phosphorus in the Midwest rather than relying on foreign markets.

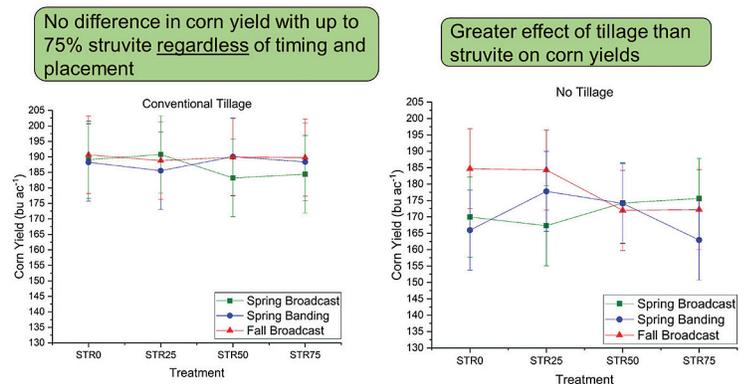


Figure 2. Field trial of struvite-MAP blends (0 to 75% struvite) for corn at Urbana, IL in 2019. No significant difference across struvite-MAP blends, nor placement or timing, but a significant effect of tillage. In other words, choice of tillage in 2019 had a larger effect on corn yield than using struvite for up to 75% of the P source.

