

October 2022 Investment Insight

Slow release P fertilizers – will they increase yields and improve environmental quality?

Dr. Andrew Margenot, along with Roland Cusick, Allan Hertzberger, and Neha Chatterjee, are investigating and confirming whether a 50/50 blend of struvite and MAP is the optimal formula for maximizing corn and soybean yields in fields that are deficient in soil test phosphorus (STP). So far they have learned that lower dissolved reactive phosphorus (DRP) loss from runoff has not compromised crop growth.

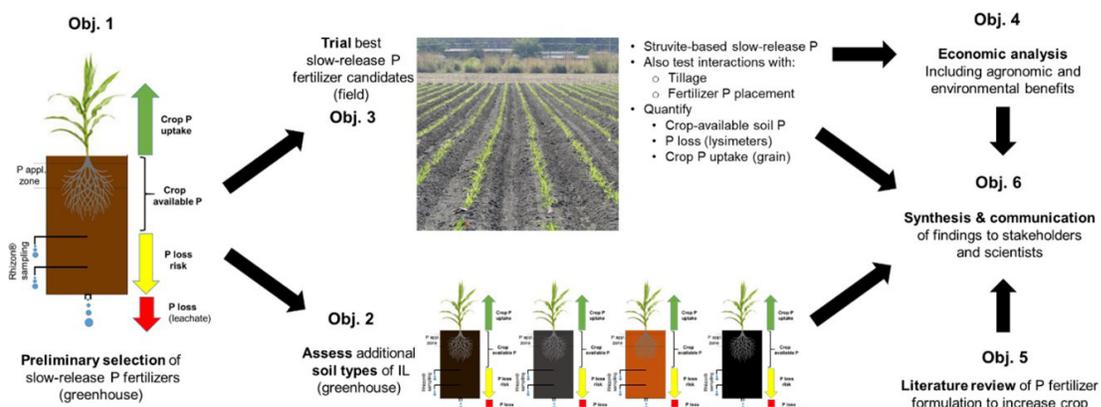
In soils with optimum-to-high STP, corn yields are unaffected by up to 75% struvite substitution and yields of double-cropped wheat and soybean are unaffected by up to 100% struvite substitution for MAP. This likely reflects 'banked' P from previous applications, but on the other hand is representative of STP in Illinois production agriculture.

In comparing two years, timing (fall vs spring) and placement (broadcast vs banding) did not influence corn yield with struvite-MAP blends of up to 75% of total P in 2019 and 2020 for corn at three sites (Urbana, Effingham, and Streator). Likewise, soybean at two Urbana sites in 2019 and 2020 and wheat in 2019 at Urbana showed the same if soil test P levels were adequate. Thus, at maintenance rates (Illinois Agronomy Handbook), struvite can be a

near-complete substitute for MAP or DAP.

Over two growing seasons, researchers found that approximately 45-55% of struvite can remain undissolved. 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.

Adding struvite on the same P basis as highly water-soluble P fertilizers can decrease soil test P levels and water-soluble soil P, indicating it can be used to maintain yields but decrease residual soil test P values. The majority of P absorbed by corn by V7 is soil-derived, meaning that initial lags in struvite dissolution may not necessarily impair corn growth in 'typical' Illinois soils that are well-managed to have adequate soil test P levels.



Core Ideas

- Maintenance rates from the Illinois Agronomy Handbook indicate that struvite can be a near-complete substitute for MAP or DAP.
- A 50/50 blend of struvite and MAP is the optimal formula for maximizing corn and soybean yields in fields that are deficient in soil test phosphorus (STP).
- Timing did not influence corn yield with struvite-MAP blends of up to 75% of total P.
- Yields were fine with struvite, but there was lower leaching and residual test P. Thus, we can decrease P losses while maintaining yields.



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