Integrated Phosphorus Placement and Form to Improve Wheat Grain Yield

The bioavailability of phosphorus (P) is generally low in soils due to continuous P fixation or sorption by soil components. In low-P soils, crop contact with P fertilizer may be limited by fertilizer placement that is too distant from the roots. Thus, researchers at the Chinese Academy of Sciences hypothesized that applying a P form with higher mobility would achieve greater crop yields compared with P forms with lower mobility at distant P placement.

The researchers recently published their results in *Agronomy Journal*. They found that increasing the distance of the band horizontally from the row results in P deficits in early growth stages of wheat seedlings and a significant reduction in wheat grain yield and P uptake when using a P form with lower mobility, such as monocalcium phosphate. Application of diammonium phosphate with greater P mobility compensates for the reductions in wheat grain yield by increasing root length.

Providing a nutrient supply in the root zone is the best strategy for high-efficiency use of fertilizer. The selection of P fertilizer placement based on the mobility of nutrients for specific fertilizer forms in different soils is critical to attaining these goals.


Making Phosphorus Fertilizer from Dairy Wastewater with Aluminum Water Treatment Residuals

Phosphorous (P) is a nonrenewable resource, and with the current rate of use, the global reserves may be depleted in 100 to 250 years. Phosphorus recovery from agro-industrial wastewaters can improve the sustainability of P use in agriculture.

Researchers tested the feasibility of recapturing P from dairy wastewaters rich in organic matter and high in P concentrations (60–100 mg L⁻¹) using aluminum-based water treatment residuals (Al-WTR). The resulting P-rich (500–700 mg kg⁻¹ Olsen P, ~10 g kg⁻¹ total P) aluminum/organic composite of water treatment residuals (Al/O-WTR) was applied as fertilizer in screen houses using romaine lettuce planted in soils with limited bioavailable P (<10 mg kg⁻¹).

In the *Soil Science Society of America Journal*, the researchers compared selected Al/O-WTR applications with commercialized P fertilizers. The results clearly demonstrated that there is no significant difference in terms of crop yield and quality between the Al/O-WTR applications and common P fertilizers. Rate comparisons of Al/O-WTR (circa 0, 2, 3, 5, and 7 g per kg soil, equivalent to 0, 6, 10, 15, and 22 t Al/O-WTR ha⁻¹) showed that the highest additions of Al/O-WTR produced the highest lettuce yield.

Therefore, recovery and re-use of P using Al-WTR may improve the sustainability of nutrient cycling in agriculture.