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OPTIMIZING FERTILIZER PLACEMENT FOR INCREASED CORN YIELD

Increasing trends in corn yields require greater levels of applied nutrients per acre to maintain and to increase yields; thus, we need to reevaluate how to sustainably meet our crops' nutrient requirements. A significant challenge associated with applying more fertilizer to support greater corn yields is the potential for negative environmental effects. Nutrients such as phosphorus (P) bind tightly to soil particles and can be lost through soil erosion and runoff that ultimately leads to eutrophication in nearby water bodies. Another challenge is economic, as producers cannot simply apply large amounts of fertilizer due to the cost. These challenges are just a couple of reasons why reconsidering fertilizer management is becoming a more vital component of producers' cropping plans.

WHY BANDED P FERTILIZER?

Correct placement of the fertilizer in relation to the plant is essential to an efficient fertilizer management program. Most P fertilizer applications are traditionally broadcast across the entire soil surface due to ease and speed of application; however, broadcast fertilizer is vulnerable to environmental loss and is not immediately accessible to the plant roots. Instead, banding the fertilizer beneath the plant increases the root interception of the nutrients and decreases the vulnerability of the nutrients to surface runoff and erosion. With the advent of precision technology, banded fertilizer applications can be applied with sub-inch accuracy, allowing growers to align planting and fertilizing operations. Additionally, banding fertilizer causes minimum disruption to soil structure in all tillage systems, including conservation systems using strip tillage. Banding of P fertilizers is generally more advantageous

where soil test levels are low, when soils are cool or wet and limit root growth, or where soils have a high tendency to fix P into unavailable forms. A major advantage of banding fertilizer is to initiate better early-season plant growth when kernel ovule potential is being determined, thereby setting the potential for greater yields.

OPTIMIZING FERTILIZER PLACEMENT

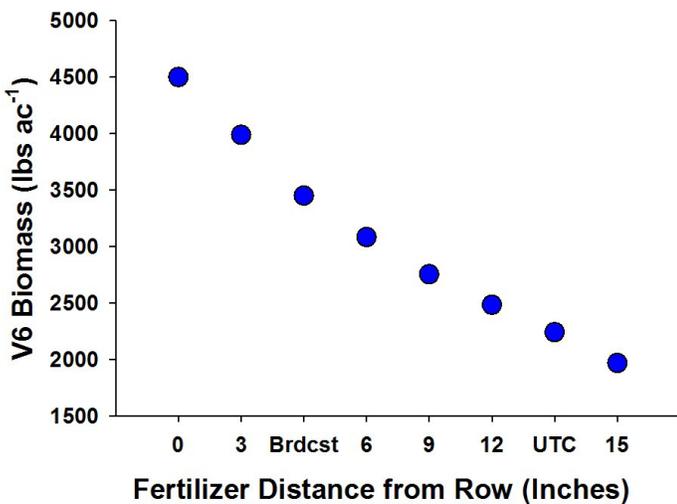
In 2014 an experiment was designed on a silt loam soil to assess different fertilizer placements (broadcast, or bands 0, 3, 6, 9, 12, and 15 inches from the plant row) using 100 pounds of P2O5 per acre as MicroEssentials SZ (12-40-0-10S-1Zn). MicroEssentials SZ and other fertilizers with low salt indices are good candidates to place in close proximity to the seed via band applications. Care should be taken when applying concentrated forms of nutrients with high salt indices in close proximity to young plants, especially in dry conditions or in sandy soils. Despite our research being conducted on a soil testing high in P (approximately 60 ppm), there were substantial increases in early vegetative growth from placing fertilizer in closer proximity to the crop row (Figure 29).

The increase in early season growth from fertilizer banded 3 inches or less from the corn row resulted in the greatest final grain yield (Figures 30 and 31). Broadcast fertilizer applications performed similarly to banded applications 6 inches away from the row, but they outperformed banded applications more than 6 inches from the crop row. This finding indicates that the crop row needs to be within 6 inches of the fertilizer band to reap the yield benefits of banded over broadcast fertilizer applications.

Figure 29. Early-season growth responses evident between the treatments that received banded fertilizer either 15 inches between the rows (left) or directly beneath the row 0 inches (right) in soils testing high in phosphorus.



Figure 30. Early-season biomass yield of treatments comparing broadcast (brdcst) and multiple distances of banded fertilizer from the row.



SUMMARY

Banded P fertilizer within close proximity to the corn plant has several advantages over broadcast applications enabling plants to better respond to fertilizer during critical stages of early growth when the yield potential of the crop is being established. Broadcast P fertilizer applications may be warranted when planting operations cannot match the fertilizer bands within 6 inches from the crop row. Regardless of soil test values, corn plants may benefit from sensing nutrients banded in close proximity to the plant during important early growth stages. Skilled field operators or precision equipment guidance is needed to have planting and fertilizer applications made within the desired threshold of accuracy.

Figure 31. Final grain yields from treatments comparing fertilizer placement at multiple distances from the row.

