NITROGEN AND PHOSPHORUS FERTILIZER PLACEMENT IN CORN PRODUCTION

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The use of strip tillage and other conservation tillage practices are used to conserve soil and soil water through residue management and reduce tillage costs in many areas of the Corn Belt. However, in the Pacific Northwest these tillage practices are less common. Strip tillage is becoming more common in the sugar beet industry in southern Idaho, and due to the high dairy cow populations, corn production is increasing. The dual use of strip tillage for sugar beet and corn production will likely continue to develop, increasing the need for strip tillage best management practices in this region.

Strip tillage is a practice that creates a residue free and tilled zone, approximately 15 to 38 cm wide and 15 to 20 cm deep. The remaining portion of the field is not tilled and the residue from the previous crop remains on the soil surface. Strip tillage allows for deep banding of fertilizers via a shank to a depth of at least 6 inches. Comparisons of common fertilizer placement strategies with strip tillage needs to be compared to common conventional tillage fertilizer placement practices in order to assess overall differences between the systems. Many studies have observed mixed results when evaluating fertilizer placement in corn production. Most studies, though, have shown that starter fertilizer placed in a band near the seed can benefit early corn growth. However, increases in corn grain yields are less common. Low initial soil test phosphorus concentrations are the most common conditions in which corn grain yields increased as a result of starter fertilizer applications.

In this study, we evaluated the effects of common and logical nitrogen and phosphorus placements with strip tillage and conventional tillage on grain yield on four sites during 2007 and 2009 at the USDA-ARS Northwest Irrigation & Soils Research Laboratory at Kimberly, ID. During each year, two locations (eroded and non-eroded soils) were utilized in the study. Band placement of fertilizer with strip tillage increased corn grain yield by 12.5% (11 bu/acre) and 25.9% (26 bu/acre) on the eroded locations compared to broadcast nitrogen and phosphorus and 2×2 nitrogen (2 inches to the side and below seed with planter) under conventional tillage in 2007 and 2009, respectively. The grain yields for all treatments and years ranged from 86 to 125 bu/acre on the eroded sites. There were no differences in grain yields between all fertilization practices on the non-eroded locations during both years of the study (average grain yields were 100 and 124 bu/acre in 2007 and 2009, respectively). The increased grain yields on the eroded areas likely resulted from better utilization of phosphorus by the plant due to concentrated placement in a band below the seed and not due to difference in tillage practice. The eroded areas of the study had free lime content that was on average two times greater than on the non-eroded areas (20.3 vs. 10.2% free lime). The band application of the phosphorus likely reduced the "tie up" of plant available phosphorus with calcium. The differences in free lime content between sites resulted from the erosion of topsoil on the top end of the fields, exposing the calcareous subsoil associated with many soils in this region. Reduced costs of strip tillage with associated band placement of fertilizer could increase the economic productivity of many acres of eroded/low fertility land in the Pacific Northwest used for corn grain production. *For more information, contact David Tarkalson at 208-423-6503, or david.tarkalson@ars.usda.gov.*