Phosphorus Use Efficiency in Washington Spring Wheat

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Declining reserves, skyrocketing prices and environment pollution associated with phosphorus (P) fertilizer are spurring efforts to develop crops and cropping systems that use this resource more efficiently. Sales of fertilizer across Washington Counties indicate that phosphorus fertilizer application is prevalent across Eastern Washington. Despite that, there is a net export of P from the soil due to crop harvest.

Field trials were conducted in six environments in 2009 and 2010 to test the responsiveness of five spring wheat cultivars to P fertilizer. The trials were planted across the dryland grain production region of Eastern Washington representing conventional, organic and no-till management. Each site consisted of two fertilizer treatments, 20 lbs/acre of P fertilizer and no additional P, and five cultivars, Alpowa, Blanca Grande, Louise, Otis and Walworth, arranged in split-plot design with four replicates. Data on P uptake in the leaves and seeds over time were taken along with yield data.

A cultivar-dependent yield response to P was found in conventional and organic environments regardless of whether soil phosphorus levels tested as "sufficient" (>15 ppm, bicarbonate assay) or "insufficient" (<12 ppm). P fertilizer increased the tillering and final spike density of the wheat crop resulting in greater yield when there was sufficient rainfall to fill the grains. There was no response to P in the no-till sites. The most efficient users of P are most clearly differentiated in low P, drought-prone environments such as Lind, WA. Alpowa and Louise are efficient users of phosphorus, both yielding the highest and taking up the most P in the leaves and grain. They consistently outperformed three other spring wheat cultivars: Blanca Grande (hard white), Otis (hard white), and Walworth (hard red). Further studies are needed to determine the extent of genetic variation for P use efficiency among regionally adapted wheat cultivars.

Reducing Soil Compaction to Improve Winter Wheat Yield

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Producers in the dryland (<12 inches annual precipitation) cropping region of eastern Washington continue looking for methods to improve water infiltration, reduce restrictive soil compaction layers, maintain crop residue to prevent wind erosion and improve winter wheat grain yield. The Case IH Ecolo-til 2500 minimum-till ripper is an implement designed to minimize residue decomposition, reduce soil compaction, and increase water infiltration. The objective of this research is to determine if this implement benefits dryland winter wheat- summer fallow production. A 10-acre on-farm test was initiated in the fall of 2008 after winter wheat harvest examining two treatments: 1. Case IH Ecolo-til 2500 operation; 2. Check (no treatment). The on-farm test was repeated in 2009. The study was a RCBD with five replications each year. Data collected included soil compaction to a depth of 18 inches, soil moisture to a depth of 4-ft in 1-ft increments, grain yield, and grain quality. Overall the Case IH Ecolo-til 2500 minimum-till ripper significantly reduced soil compaction in the subsequent winter wheat plots between 7.8-14.0%. No differences in soil moisture were detected between treatments. Grain yield varied between treatment and years (P<0.04) with the Case IH Ecolo-til 2500 minimum-till ripper treatment increasing yield 3.4% in the 2008 site. No difference in grain yield was detected in 2009. Grain protein and test weight remained equal between treatments each year.

Managing Soil Nitrogen and Weeds Using Legume and Cereal-intensive Cropping Systems during the Transition Phase for Dryland Organic Wheat Production in Eastern Washington State

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Nine crop rotation systems were evaluated in Pullman, WA, during the transition to organic production (2003-05) to address soil fertility and weed management challenges experienced by dryland organic cereal growers in Eastern WA. Systems ranged from intensive small grain production to intensive legumes for forage (FOR; alfalfa + oat/pea) or green manure (GRM), and included systems with alternating small grains and legume GRM. The entire study was sown to certified organic spring wheat (SW) in 2006