Soaking Winter Wheat Seed in Water to Enhance Emergence

W.F. SCHILLINGER, H.L. SCHAFER, S.E. SCHOFSTOLL, AND B.E. SAUER, DEPT. OF CROP AND SOIL SCIENCES, WSU

Insufficient stand establishment of winter wheat is a major problem in the low-precipitation (< 12 inch annual) dryland summer fallow region of the inland Pacific Northwest. Low seed zone water potential, deep planting depths with 5 inches or more soil covering the seed, and soil crusting caused by rain before seedling emergence frequently impede winter wheat stands. A multiple-year field study was initiated at Lind in early September 2004 to determine seed priming effects on winter wheat emergence and grain yield. Two wheat varieties were used based on their strong (Edwin) and moderate (Eltan) emergence capabilities. The three early phases of germination are: i) imbibition, ii) lag phase, and iii) protrusion of the radicle through the testa. Priming is a procedure that partially hydrates seed to initiate the germination process. The experiment has four treatments: Edwin and Eltan seed both primed and not primed (i.e., check). Primed seed was soaked in water for 12 hours, and then spread on a concrete platform for 15 minutes at 60^0F air temperature under cloudy conditions. Within the subsequent 3-hr time period, seed from all four treatments was then planted into summer fallow with 5 inches of soil cover in 200-ft-long plots with a John Deere HZ deep furrow drill.

After 12 hours of soaking in water, wheat seeds were "glumped" together. But, after just 15 minutes of removal from the water, individual kernels separated easily. Primed seed was soft and kernels were easily destroyed by pinching between fingernails. We were concerned that primed wheat kernels would be damaged when passing through the flutes of the grain drill, but this did not occur. Less than one percent of primed wheat kernels were damaged passing through the grain drill. Primed seed of both varieties emerged significantly better than their checks (Fig. 1). Emergence of Eltan increased dramatically with priming whereas priming had much less effect on Edwin (Fig. 1). In a related study, we found a similar trend between the varieties Edwin and Madsen that were soaked in several priming media (G.S. Giri and W.F. Schillinger, *Crop* Science, 2003). Grain yield and yield components will be measured in July 2005. We plan to continue this experiment for several years.

Tillage Method and Sowing Rate Relations for Dryland Spring Wheat, Barley, and Oat

BILL SCHILLINGER, DON WELLSANDT, HARRY SCHAFER, STEVE SCHOFSTOLL, AND STEVE DOFING, DEPT. OF CROP AND SOIL SCIENCES, WSU

No-till (NT) sowing of spring cereals directly into undisturbed stubble of the preceding crop has gained popularity in the inland Pacific Northwest (PNW). But some farmers report lower grain yield of spring cereals with NT compared to sowing after conservation tillage (CT) of the soil. A 4-yr field study was conducted in a 12 inch annual precipitation zone on the Don Wellsandt farm in Adams County, WA to determine sowing rate effects on seed-zone water content, seed-zone temperature, plant stand establishment, grain yield, grain yield components, and straw production for three spring-sown cereal species using both NT and CT. All factors other than tillage method (i.e., drill, fertilizer rate, sowing depth, sowing date) were held constant. Soft white wheat (*Triticum aestivum* L.), barley (*Hordeum vulgare* L.), and oat (*Avena sativa* L.) were sown at three rates: 120, 200, and 280 seeds per square yard (roughly 30, 60, and 90 lbs/acre, respectively). A split-plot design was used, with NT and CT as main plots and sowing rate x cereal species combinations as subplots. Residue cover measured just before planting was 87 and 46% for NT and CT, respectively. There were no differences in plant stand between NT and CT, but grain yield was reduced in NT in part due to less water in the seed zone (2-to 6-inch soil depth) compared to CT during early plant development. Likely, disruption of capillary continuity with CT restricted upward movement of water that resulted in greater retention of water in the seed zone underlying the depth of tillage. With NT, soils retained less water in the seed zone but remained wetter near the surface due to greater upward movement and higher residue cover that slowed evaporative loss during the early weeks after sowing. Grain yield was not affected by sowing rate for any crop species because increased number of heads per unit area and kernels per head consistently compensated for reduced plant stand density. Tillage method x crop species and tillage method x sowing rate interactions did not occur for grain yield or any grain yield component. Results show that grain yield of NT across crops was significantly reduced by 90 lbs per acre per year (or 5%) compared to CT.