

EFFECTS OF LOCAL CORN DEBRIS MANAGEMENT ON FHB AND DON LEVELS IN SEVENTEEN U.S. WHEAT ENVIRONMENTS IN 2011 - 2013

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ABSTRACT

Reduction or elimination of within-field sources of inoculum of *Fusarium graminearum* is the basis for cultural control measures such as crop rotation sequences in which cereals follow non-cereal crops. The goal of this USWBSI research project is to provide realistic estimates of 'DON reduction' that can be expected from cultural controls that reduce within-field inoculum sources. We utilized moldboard plowing of corn debris as a proxy for planting after a non-cereal crop to compare directly with wheat planted no-till into corn debris in commercial-scale wheat fields planted following grain corn harvest in Illinois, Kentucky, Michigan, Missouri, Nebraska, New York, and Vermont. Following corn harvest, replicated wide (60 ft) strips were moldboard plowed or left non-plowed prior to sowing wheat over the entire field with a no-till drill. Wheat in each strip was monitored for FHB and sampled for laboratory quantification of head infection by *F. graminearum* and contamination of grain by DON. Results were collected over three years, 2011, 2012, and 2013, from winter wheat in three states (IL, NE, and NY) and over two years, 2011 and 2012, from winter wheat in three states (KY, MI, and MO) and from spring wheat in one state (VT).

In 2011, FHB symptoms at soft dough stage were low to moderate at every location except Missouri. Yet, at crop maturity, a high percentage of wheat heads was found to be

infected by *F. graminearum* in all locations except Nebraska and Vermont. Measurable DON was found in grain from every environment and the levels were lowest in Vermont and highest in Kentucky and Nebraska. It is interesting that the Nebraska site showed the lowest disease index and lowest incidence of head infection, but the highest average toxin level. Moldboard plowing resulted in a significant decrease in FHB index in four environments (IL, MO, NY, MI), though the magnitude of the difference was large only in Missouri. In Nebraska, FHB index was significantly higher in the moldboard-plowed treatment in which the wheat crop matured earlier than in the no-till corn debris treatment. Moldboard plowing was associated with a small but significant decrease in recovery of *F. graminearum* from mature heads in three environments (IL, MI, NY). There was no significant effect of plowing on DON level in five environments (IL, KY, MO, NY, VT) and there were small but significant decreases in toxin in moldboard-plowed compared to no-till strips in two environments (MI and NE). An additional treatment of minimum tillage (chisel plow) was added in the Michigan experiment; DON levels in the minimum-till plots were intermediate between moldboard and no-till but not significantly different from no-till.

In 2012, a generally warm and dry cropping season across the experimental region, FHB

symptoms at soft dough stage were not observed in four locations (KY, MI, NY, VT) and were observed at low levels at three locations (IL, MO, NE); plowing had no significant effect on FHB index in any location. At crop maturity, a moderate percentage of wheat heads (i.e., greater than 10%) was found to be infected by *F. graminearum* only in Missouri and Vermont; in both environments there was a significantly greater incidence of heads infected in no-till than in moldboard-plowed strips. DON was not detected in Nebraska, and was detected at low levels in all other states. Moldboard plowing resulted in a significant decrease in already low DON levels in New York and Vermont. A similar level of reduction in DON level was observed in wheat from moldboard-plowed strips in Michigan, but DON was assayed in small samples that were pooled from the replicate strips, so no statistical comparison could be made.

In 2013, at soft dough stage, FHB index exceeded 25% in IL but was less than 5% in NE and NY, yet DON levels exceeded 2 ppm in all three locations. Neither FHB Index nor DON differed significantly by tillage treatment in IL or NE. Plowing did not result in reduction of infection incidence of mature heads in any location. Plowing of corn debris resulted in significant reductions in FHB and DON in NY.

There is a strong trend in three years of data suggesting that inoculum from area atmospheric sources exerts a far greater effect than inoculum from in-field corn residue on the level of DON contamination, and this is especially true in years with severe epidemics. Yet, where economically and logistically feasible, avoiding cereal residues within wheat fields, through appropriate rotational sequence, will sometimes result in modest reductions in DON, especially when weather conditions are only moderately favorable for epidemics. Therefore, cultural practices that avoid corn and small grains debris within wheat and barley fields still have a valuable though incremental role to play in the integrated management of FHB and DON.

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