CEREAL RYE CULTIVAR SELECTION FOR IMPROVED COVER CROP PERFORMANCE

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Cover crops provide a number of benefits to agricultural systems, including soil conservation and nutrient retention, soil carbon sequestration, soil water storage, and weed suppression. Cereal rye is planted on more acres than any other cover crop species in the U.S. in part because it can reliably produce substantial biomass in a wide range of growing conditions. With its deep roots, cereal rye also has an outstanding ability to scavenge inorganic nitrogen from the soil profile, reducing economically- and environmentally-costly losses of plant-available nitrogen during winter months. Compared to other small grain cover crops like wheat, cereal rye provides earlier ground cover, reducing the potential for soil erosion and increasing weed suppression. Thus, of the common small grain cover crops, cereal rye remains an excellent choice and has much potential to provide benefits of cover cropping to Kentucky's producers.

In order to maximize these benefits, producers should utilize cereal rye cultivars that are well-adapted to Kentucky. Previous research on a limited number of cultivars conducted in Iowa and North Carolina has shown that cereal rye cultivars differ in aboveground biomass production, total nitrogen uptake, weed suppression, and effect on subsequent crop yield. Much of the variation in variety performance can be attributed to where the variety was developed, with varieties developed in northern states (i.e., cool-season varieties) performing better in cold climates and varieties developed in southern states (i.e., warm-season varieties) performing better in mild climates. For Kentucky's producers, deciding between a cool- or warm-season variety is challenging and the optimal variety may depend on planting date.

We are currently conducting research, funded by the Kentucky Small Grain Growers Association, on the performance of different cereal rye cultivars and triticale that are planted at two dates; this research is at the Spindletop Farm outside of Lexington. Specifically, we are examining ground cover and aboveground biomass, rooting depth, changes in soil nitrate, and weed suppression. Six different types of cover crops were planted on two dates – 9/14/18 and 10/24/18. The cover crops included four known cereal rye cultivars—two cool-season cultivars 'Aroostook' (Figure 1) and 'Wheeler' and two warm-season cultivars 'Florida 401' and 'Wrens Abruzzi' (Figure 2). We also included a 'variety not stated' cereal rye and triticale ('NE 426GT'), and a bare ground control.

Our first year of data collection revealed that the optimal variety differed depending on planting date: for early-planted cover crops, the warm-season varieties produced less biomass than the cool-season varieties and triticale (Figure 3); however, for late-planted cover crops, aboveground biomass was similar across varieties and averaged approximately 520 lbs/acre (not shown). We believe that weather conditions over the 2018-19 growing season had a large influence on cover crop growth. Warm and wet conditions in the fall of 2018 were ideal for cover crop growth and the warm-season cultivars had jointed by early 2019; the polar vortex conditions in January 2019 then killed most of the aboveground biomass on these cultivars. The cool-season cultivars did not exhibit this damage, nor did triticale. None of the late-planted cover crops showed damage from these harsh winter weather conditions, likely because they did not accumulate much aboveground biomass by this time.

Weed biomass within the cover crops was not affected by variety, but was greater in the later planted cover crops (300 lbs weed biomass/acre) compared to those planted earlier (150 lbs weed biomass/acre). Density of early-emerging summer annual weeds, like common ragweed and common lambsquarters, was similar across all cultivars; marestail density was also similar across treatments. Weed density, however, was highly variable. Soil nitrate concentration at the time of cover crop termination was negatively related to cover crop biomass, and only cool-season varieties significantly reduced springtime soil nitrate relative to the unplanted control (Figure 4).

Our first-year results indicate that cereal rye cultivars differ in cover crop performance, and that some of these performance indicators are affected by planting date. We are currently conducting a second year of research, and continuing to analyze also separating cover crop roots from soil cores. Stay tuned for additional information about rooting depth, root biomass, and ground cover provided by these cultivars!

For more information about cover crop research at UK, please see the following articles:

Wheat vs. cereal rye as a cover crop in the February 2019 issue of Wheat Science Newsletter: https://wheatscience.ca.uky.edu/newsletters

Annual ryegrass vs. cereal rye cover crops in Volume 1 issue 2 of the Corn and Soybean newsletter: https://www.kygrains.info/corn-and-soybean-news

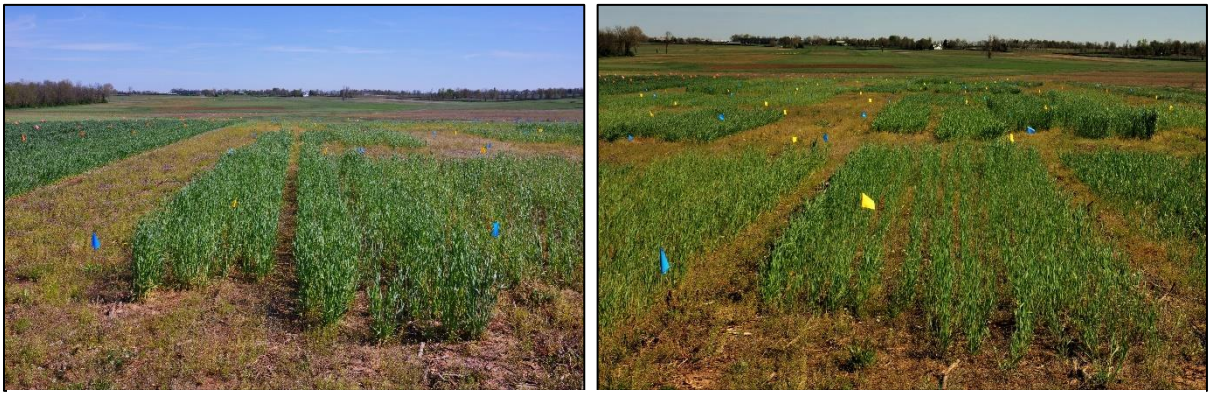

Figure 1. Early (left) and late (right) planted Aroostook cereal rye prior to termination on 4/16/19. Aroostook is a cool-season cultivar that produced the most biomass of the early-planted cover crops.

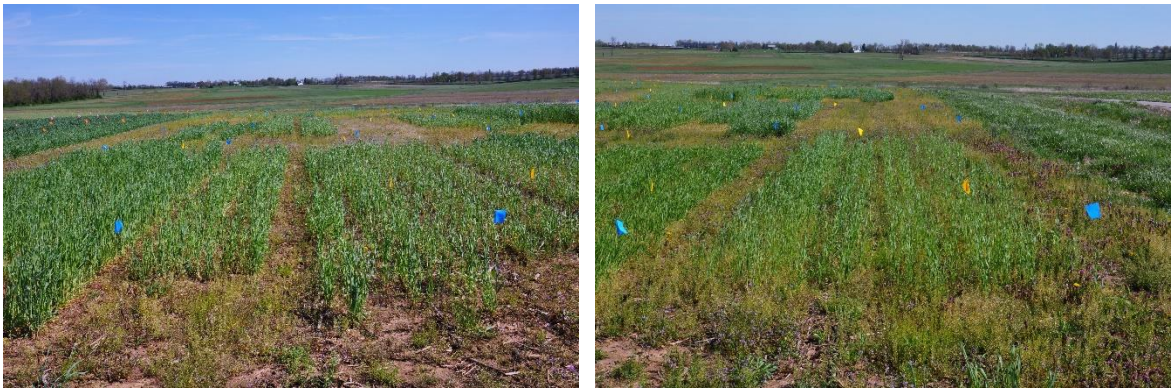

Figure 2. Early (left) and late (right) planted Wrens Abruzzi cereal rye prior to termination on 4/16/19. Wrens Abruzzi is a warm-season cultivar.

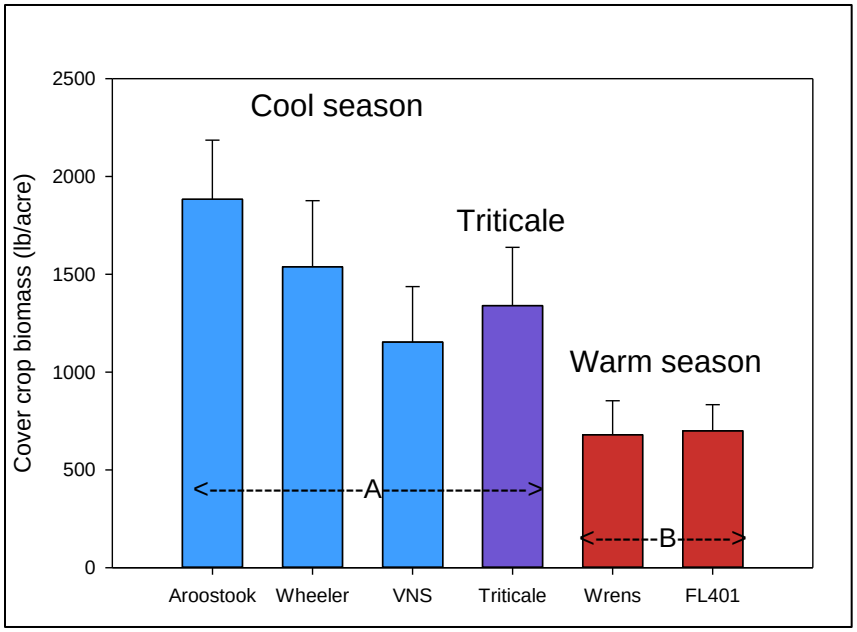

Figure 3. Average aboveground biomass for early-planted cover crops, sampled in April 2019, from Lexington, KY. Error bars represent one standard error. Cover crops were planted on 9/14/18 and are grouped into cool-season cereal rye (blue), warm-season cereal rye (red), and triticale (purple). Groups with the same capital letter are not significantly different. No differences in biomass were detected for late-planted cover crops (not shown).

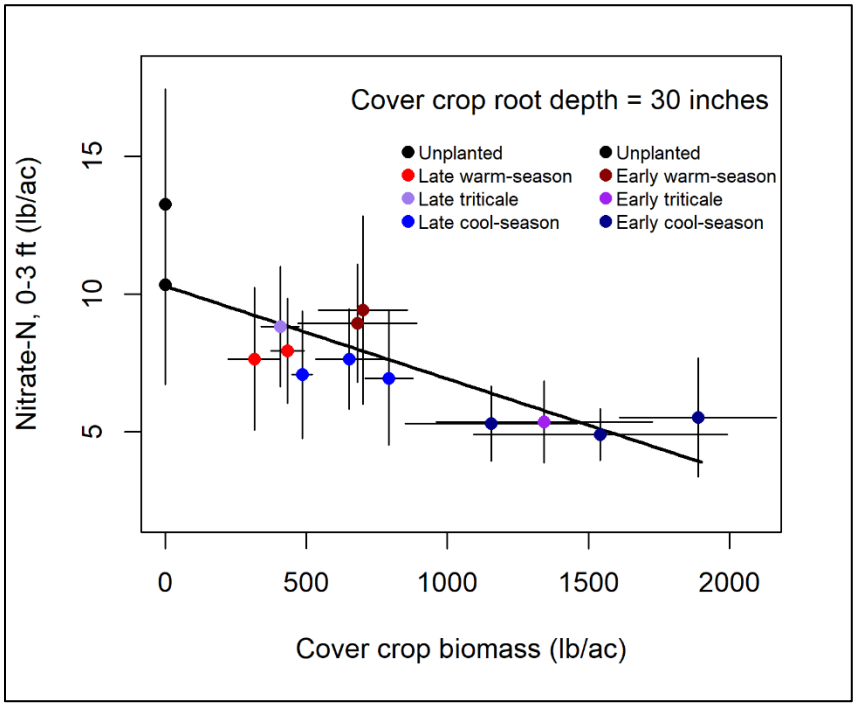

Figure 4. The amount of nitrate-nitrogen present in the soil profile at the time of cover crop termination in response to cover crop biomass level. Colors represent experimental treatments (late = late-planted; early = early-planted; warm-season = Wrens Abruzzi and FL401; cool-season = Aroostook, Wheeler, and Variety Not Stated). Error bars represent ± one standard error.