Effects of Various Cover Crops on Grain Yields and Weed Pressure in a Corn, Soybean, Wheat Rotation Part II

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Introduction:
In Wisconsin, incorporating cover crops into the farming system is gaining interest among producers beyond the no-till and organic farming communities. Because cover crops are new to some producers, there are many questions ranging from seeding rates, nitrogen contributions, weed suppression capabilities to impacts on grain yield. There is also a lack of local/regional recommendations for the use of cover crops in corn-soybean and corn-soybean-wheat rotations in Wisconsin. Planting cover crops after winter wheat provides the broadest number of cover crop options because after a typical corn grain or soybean harvest the number of species is limited by the first frost date and onset of winter.

This Badger Plot project evaluated six single species and three mixed species cover crops in a replicated on-farm research trial (Fig. 1). Farmer interest and county involvement from multiple agencies including University of Wisconsin-Extension, Dodge County Land Conservation, and USDA-NRCS were critical to the project’s success in its first and second years.

Extension and Outreach Goals:
1. Conduct a field day for technical service providers including UWEX, Land Conservation, and NRCS personnel, custom applicators, and crop consultants.
2. Host a second field day for local producers and crop consultants.
3. Develop a partnership between the UWEX Crops and Soils Agent, staff from the Land Conservation Dept., NRCS, local grain producers, local custom applicators, and local seed distributors.

Research Hypothesis:
We hypothesize that the use of cover crops will increase nitrogen recovery, improve soil quality, and increase grain yields in a corn-soybean-winter wheat rotation.

Methods:
The single species cover crops were frost-seeded red clover, crimson clover, spring barley, oilseed radish, red clover, annual ryegrass, and sudangrass (see Table 1). The three species mixes were crimson clover/oilseed radish, hairy vetch/oats, and field peas/oilseed radish (see Table 1). The plots were 60 feet wide and 50 feet long in a completely randomized arrangement with three replicates per cover crop treatment. The soil types for the experimental area were Mayville, Elburn, and St. Charles silt loam soils.

For the frost-seeded red clover treatment, plots were seeded with 10 lbs per acre on April 3, 2013. The weather conditions on April 3, 2013 were sunny with a prior night temperature of 31°F and the soil surface was frozen. Cracked corn was used as a carrier for the clover seed and broadcasted using a lawn spreader.
Methods continued:

After the winter wheat harvest, the remaining cover crop treatments were seeded on July 30, 2013 using a 10 foot wide Great Plains drill (courtesy of Wings Over WI, tractor courtesy of WI DNR). All red clover and hairy vetch/oat plots were terminated on October 17, 2013 with glyphosate (Roundup WeatherMax™, Monsanto, 44 fl oz/acre), dicamba (Clarity™, BASF, 8 fl oz/acre), and 2,4-D amine (16 fl oz/acre) with ammonium sulfate (2.5 lbs per acre) and non-ionic surfactant (0.25% v/v).

On May 20, 2014, the plots were planted with two corn hybrids, PO419A and DKC53-56 RIB, in a split-plot design. Each plot contained 24 thirty inch rows, the plot was divided into two twelve row sections and planted with either hybrid. Thirty feet from the center three rows of each sub-plot were harvested on November 7, 2014. Yields are reported in bushels per acre and were adjusted to 15.5% moisture.

Results:

The dominant weed species present in October 2013 was volunteer winter wheat. Percent control or efficacy was rated based on the percentage of cover crop canopy that smothered out volunteer winter wheat. Spring barley, sudangrass, and the hairy vetch/oats mix exceeded 90% control. The other cover crop treatments ranged from 40% to 88% control.

Biomass and stand counts for each cover crop treatment were measured in October 2013 before termination (Fig. 2). Only the frost-seeded red clover treatment was significantly different from the control. Field days for technical service providers and producers were held on October 1 and October 2, 2013 at the Badger Plot project site (Fig. 3). Over seventy five people attended each field day.
Results continued:

Yield of the corn crop following the cover crops was averaged for all replicate plots (Fig. 4). Only frost-seeded clover plot corn grain yields were significantly different from the control plots, where no cover crop was seeded following the winter wheat harvest. Average yield for frost-seeded clover and control plots were 234 and 208 bushels per acre, respectively. All cover crop plots that contained a legume ranged from 212 to 234 corn grain bushels per acre. Corn grain yield for the grass cover crop plots ranged from 198 to 200 bushels per acre.

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