Western Illinois University/ Allison Organic Research Farm

2008 Cover Crop/ Corn Yield Experiment

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Introduction:

Motivated by a variety of concerns (e.g., spiraling input costs, compaction, root health, extreme weather events, USDA conservation program payments), farmer interest in cover crops has grown dramatically in the past 5 years. Farmers are planting both traditional cover crops (e.g., small grains like oats and cereal rye) and novel species (e.g., brassicas like radish) but the best results may lie in fine-tuning traditional cover cropping practices. Red clover frost seeded into wheat is perhaps the most time-tested cover cropping system in the Corn Belt but even this system does not always result in a strong stand. This study was conducted to evaluate cover cropping options for improving organic corn performance following poor establishment of red clover frost seeded into wheat. This study was also the preliminary evaluation of radish as a cover crop in Western Illinois.

Methods:

A randomized complete block experiment with 3 replications was conducted in field 2B east at the Allison Organic Research farm (Roseville, IL) during the 2007/2008 growing season. The preceding crop was winter wheat (harvested on 7/9/07). Red clover was originally frost seeded in early March ’07 but was nearly completely eliminated by temperatures in the mid-teens over the Easter weekend. Medium red clover was rebroadcast (~ 6 lbs/ac) on 4/18/07 and a moderate stand established.

Three weeks after the wheat was harvested, the field was mowed ~ 4” high. The next day a rear mounted 6’ rotary-tiller was used to terminate all living vegetation in three 10’ wide plots for the “radish only” treatment. All other plots were left untilled. A 15’ no-till drill was used to drill 12 plots (10’ x 415’) on 8/2/07. The treatments consisted of medium red clover (already established), radish at 13 lbs/ac, and oats at 56 lbs/ac in various combinations that are listed in table 1. The no-till plots were mowed once in late September to prevent weeds from going to seed.

On 5/6/08, a rear mounted rotary-tiller was used to terminate living vegetation in all of the plots except for the “radish only” plots. The “radish only” plots had very little living vegetation at this time (Fig. 3). The clover in the rest of the plots was ~10” tall at the time of mowing and was a moderate stand with about 50-60% ground cover.

On 5/19/08, potassium sulfate was broadcast (280 lbs/ac) over all the plots. On 5/28/08, all the plots were lightly tilled with a soil finisher to incorporate the fertilizer and eradicate small weeds.

All plots were planted to corn (Blue River Hybrids 66P32 -112 day) on 5/29/08 using a 16 row airflow planter (Fig. 4). The target population and depth were 30,000/ac and 2". All plots were rotary hoed on June 2nd and June 11th and cultivated on June 19th using a Buffalo 4 row cultivator when the corn was approximately 10 inches tall and in the V4-V5 growth stage. Wet weather conditions prohibited any subsequent row cultivations.

All plots were harvested with a JD 9650 STS combine on 11/5/08 and yields were determined using a weigh wagon. Corn stands were estimated by counting the number of stalks in each plot for 17.6' of row after harvest near the east end of the plots.

Table 1:

Cover Crop Treatment	Grain Moisture%	Corn Stand	Corn Yield Bu/ac
(1) Radish	18.8%	24,300/ac	149.0
(2) Clover/radish	18.8%	23,700/ac	142.2
(3) Clover/radish/oats	19.1%	25,300/ac	139.5
(4) Clover/oats	18.8%	22,300/ac	131.9
	LSD (0.05)=0.47	LSD (0.05)=4,348	LSD (0.05)=20.0

Results:

The yields, grain moisture contents and stand counts were not significantly different between the systems at alpha = 0.05. With alpha set at 10%, the "radish only" system yielded more than the clover/oat system but the radish systems were not significantly different. The radish only system produced the most above ground cover crop biomass (data not reported) in fall 2007.

Discussion:

The growth of radish preceding corn appeared to have a growth promoting effect but statistical evidence of this was limited by lack of replications (only 3) and an unexplainably low yield (lowest of all plots by 13 bu) for one of the clover/radish/oats plots. Without this apparent outlier, more radish treatment effects would likely have been detected.

During the fall of 2007, radishes grew more vigorously in the "radish only" plots with pre-plant tillage than in the no-till plots (Fig. 1.) This tillage effect was also observed in other non-replicated areas at the Allison farm where radishes were planted with and without tillage. The greatest radish biomass production on the farm was in end-rows where soybean residues had been incorporated immediately

prior to drilling (Fig. 2) suggesting that soil physical properties and N may have constrained radish biomass growth in the experimental plots.

The “radish only” plots appeared drier (data not collected) and had very little weed growth during April, suggesting potential for omission of pre-plant tillage. There also appeared to be less in-row weed growth in the corn following “radishes only” but this was not quantified.

Based on observations and measured results, it appears that radish has a growth promoting effect on corn even when radish growth is limited (e.g., no-till plots). Future studies are needed that explore specific growth promoting mechanisms (e.g., bio-drilling, bio-fumigation, nutrient scavenging and re-mineralization) associated with radish and critical radish biomass levels needed to achieve growth promotion.

Figure 1: View of experiment a few days after mowing of no-till plots to control weeds

Figure 2: Excellent radish growth in end-rows following incorporation of soybean biomass

Figure 3: “Radish only” strip had almost no living vegetation the first week of May 2008

Figure 4: The plots were planted to corn on 5/29/2008 using a 16 row Case-IH airflow planter