Cereal Rye Cover Crop Seeding Rates & Subsequent Soybean Yields

Lancaster County, 2004-05

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Rationale

Cereal rye is one of the most popular and easiest cover crops to grow. While it provides ground cover that aids in minimizing erosion, it gathers nutrients from deeper in the soil profile and helps with weed control through competition primarily for light. Also, it has been suggested that for late plantings of rye, higher seeding rates should be used to achieve adequate biomass production.

Objective

To compare two seeding rates of cereal rye cover crop for increases in cover crop biomass and yield of subsequent soybean crop.

Site Conditions
Cooperator:
Robert Keller
Location:
Lititz, Lancaster County
Soil type:
Sandy loam
Previous crop:
Corn
Fertilizer:
None
Variety:
Unknown
Planting Date:
Rye (early November 2004), Soybean (April 25, 2005)
Seeding Rate:
Rye (2.23 & 3.75 bu/ac), Soybean (180,000)
Tillage:
Rye - disc harrowed twice; Soybean - plow, disc harrow, cultimulcher
Harvest date:
Rye cover destroyed with moldboard plow, April 22, 2005; Soybean (September 27, 2005)

Methods

The field site was previously in corn that was combine harvested. Several passes were made with a disc harrow to size the stalks and loosen the soil surface for rye drilling. The two treatments used were two seeding rates for the cereal rye cover crop (normal seeding rate was 2.25 bu/ac and a higher rate was 3.75 bu/ac). A 10 foot wide drill was used to create plots that were 50 feet wide (5 passes per plot). Plot lengths extended the length of the field, which ranged from 300 to 700 feet. The two seeding rates of cereal rye grain were replicated five times within a randomized complete block design.

Small quadrat sub-samples of cereal rye were hand-clipped to the soil surface, dried and weighed to determine aboveground biomass yields. The entire field was moldboard plowed, disc harrowed and cultimulched prior to planting soybean. A 4-row corn planter with 30-inch row spacing was used to plant soybean. The field was rotary hoed and row cultivated twice to control weeds. The entire plot was combine harvested and soybean grain yields determined by transferring grain into a farm gravity bin resting on large-capacity electronic wheel weighers.

Results

Overall establishment of the cereal rye cover crop was good. Excess corn stover did interfere with the ability of the grain drill to place seed into soil and rye plant density was reduced. Visual observations of the crop in April 2005 indicated slight differences in stand densities between the two treatments. However, dry matter collection and weights revealed no significant difference between the normal and high seeding rates for aboveground biomass production.

The soybean crop following the rye cover was observed in September 2005. The stand was very uniform across both treatments, and showed good growth vigor and pod development. However, there was no significant difference in soybean yields across the two treatments. Average yields for both the cereal rye cover crop biomass and soybean grain are summarized in Table 1.

Table 1. Rye aboveground biomass & soybean grain yields.

Treatment	Rye aboveground biomass (April 2005)	Soybean grain yields (September 2005)
	------pounds/ acre------	------bushels/acre-------
Low seeding rate	3742.4	51.9
High seeding rate	3976.4	52.1

Summary (rye destroyed 4/20/05)

Cereal rye herbage density was not very great by the time the cover was sampled and destroyed. As much as 30 to 40 percent of the field lacked rye cover. Most of this open space was between the drilled rows; however, some open area was seen in the row where significant corn stover remained at the surface. The residue served as mulch that prevented the emergence of some weed that was placed into the soil. It also resisted being cut by the lightweight grain drill equipped with single disk openers, preventing seed from being placed into the soil.

It appears that the real limitation to improving cover crop stands and biomass yields was the ability to correctly place seed, not seeding rate. While more complete incorporation of residue into the soil should have permitted the drill to do a better job at planting, this is undesirable as fewer residues on tilled fields only worsens the potential for erosion losses of soil and nutrients. Use of a heavier drill that is capable of slicing through residue and placing seed at the appropriate depth in the soil should have resulted in thicker rye stands.

Further, use of a drill with openers that are spaced closer than the 7 to 8 inches utilized by most manufacturers could also have a real impact on stand density and cover crop yields early in the season when many cover crops are destroyed ahead of planting the next cash crop.

The benefits of incorporating cover crops into crop rotations are not often immediately observed. While no difference was observed in the amount of cereal rye being produced and subsequently added back to the soil in this trial, the expectations are that when growing larger quantities of cover crop, several benefits will be realized. Among them is that the cover crop will be better to compete with and reduce weed density and generate more organic matter that will improve soil quality and health. The ability to store more water for following crops, especially during droughty growing seasons, can be especially advantageous.

Trials that compare different seeding rates of small grains are planned for this site. Winter wheat was planted during the fall of 2005 and will be monitored through harvest.