**Effective Winter Rye Management for Maximum Soybean Potential – Technical Report**

**Michael Ostlie**

The field trials for the 2017 growing season were successfully established.

1. The rye planting date study was completed with 4 planting dates of 9/19, 10/3, 10/18, and 11/2, and three plant populations of 0.75, 1.25 and 1.75 million plants/a. Stand counts were taken in the fall and a visual estimate of plant survival was taken in the spring. Determining rye establishment in fall, and survival in the spring was the primary objective in this study. There were 4 replicates for this trial and it was designed as a split-plot RCBD. Data were analyzed through ANOVA and regression. Average stands for each planting date were 607551 (9/19), 970134 (10/3), 632418 (10/18) and 0 (11/2) plants/a. Spring stand establishment remained in the 90% range through the early October planting date. The mid-October planting retained 80% stand and the November stand was 60%.

As expected, the early planting had higher populations and greater levels of establishment. This will influence the use of rye as a relay crop prior to soybeans. In North Dakota, there are many cash crops harvested prior to Oct 1 that would then be suitable to plant rye into. However, many areas of the state have a corn/soybean rotation. The original idea for this study was to see how well rye would do if planted after corn (late Oct-early Nov). The rye can clearly survive that late planting, even if no material emerges in the fall. In fact the rye may not have even germinated until spring. The late planting does reduce the utilization of rye. With early planted rye, grazing, haying, or ensiling are options prior to soybean planting, along with a fall stand to reduce winter and spring erosion. The late planted rye can still provide some erosion prevention services (in the spring), weed suppression, as well as provide a firmer seed bed in saline seeps, but a livestock producer may not be satisfied.

2. The soybean planting date by rye removal study was completed with soybean planting dates of 5/15, 5/26, and 6/7. Rye removal occurred either the fall prior to soybean planting, or 2 weeks prior to planting, at planting, or 2 weeks after soybean planting. This study was organized as an RCBD with 4 replicates. It is also the capstone study from a series of trials beginning in 2013. The shared goal of all studies each year was to determine the best timing and method for terminating rye. Previous studies at the CREC showed that glyphosate was the most reliable method for termination. As such, that was the only termination method used in 2017. The assumption behind the soybean planting dates was that if soybeans were planted earlier, there would be more safety since the rye would be smaller. Unfortunately, that did not prove to be true. In 2016 and 2017 similar planting dates were used for soybeans, and in both years, there were very unusually dry May conditions. This resulted in some of the driest soil moistures of the year for both years (data not shown). In both 2016 and 2017, timely rains occurred in late May to early June, shortly after the second planting date. In both years, the second planting date had the fewest yield reductions in yield. Though it should be noted that in 2017 yield may have been reduced by terminating rye at soybean planting or late, but those reduced yields were still equal to the best treatments at later planting dates.

When combining all site years for the studies from 2013 – 2017, Table 1 is the summary of rye termination timing. There were no crop failures from have no rye present or terminating 2 weeks prior to planting. There was one soybean crop failure from terminating at soybean planting, and 3 soybean crop failures from terminating rye two weeks after soybean.

Table 1. Rye termination date relative to soybean planting date.

|  |  |  |  |
| --- | --- | --- | --- |
| average across years and planting dates | Soybean Yield |  |  |
|  |  |  |  |
| No rye check | 35.6 |  |  |
| Rye terminated 2 weeks prior to planting | 35.5 |  |  |
| Rye terminated @ planting | 33.1 | 1 crop failure |  |
| Rye terminated 2 weeks after planting | 24.2 | 3 crop failures |  |

Specifically for 2017, soybean yields were higher the earlier the soybeans were planted. However, there was a decline in soybean yield when rye was present sometime in the spring, and all termination times had a similar yield loss. For the middle planting date, yields were the same as the check except that terminated rye 2 weeks after planting reduced yields. For the last planting date (early June) all terminations performed similar.

At the second (normal planting window) planting date, several other terminations methods were included. Rye was harvested for hay prior to planting, rye was terminated with glyphosate + Spartan 2 weeks prior to planting, and rye was not terminated at all. Not harvesting rye resulted in a soybean yield of 6.9 bu/a compared to a 36.3 bu/a average for that planting date. When rye was hayed, it reduced yield to 20.7 bu/a. This reduction could be a result of soil hardening after the forage was removed, and rye regrowth for a short time after haying (until glyphosate was used at V2). Spartan was added with glyphosate as a treatment to determine if there could be any antagonism between the products and to see if there was any residual activity. Rye terminated just as well with Spartan + glyphosate as with glyphosate alone. The only weed problems in this study were green foxtail and black medic, which would not be affected heavily by Spartan, so it was unclear if the Spartan was still able to reach the soil surface and get activated.