Winter Rye in Soybeans: What You Need to Know

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Research has been conducted at the CREC since 2014 involving the rye and soybean cropping system. The concept for the system is that winter rye would be planted the fall prior to soybeans. The rye would then be terminated so that soybean production is maximized. This system provides some key benefits to soybeans. The top three reasons, in order of benefit, are 1) reducing soil erosion, 2) weed suppression, including glyphosate-resistant weeds, and 3) soil water management in saline soils. Improving soil health would be a component of several of the goals, but could also encompass increasing diversity and assisting with reducing tillage. If you are a livestock producer, extending grazing periods would fit on that list as well. Before growing rye, you need to understand many of the same concepts as you would with a cash crop. Below is a set of guidelines that will get you off to a good start.

Variety selection: With rye, like any other crop, variety matters. The success or failure of this system may come down to variety alone. Many times an available rye variety may not be known. A VNS (variety not stated) variety can still provide some of the key benefits to your system, particularly in regards to preventing erosion. Rye variety matters most for weed management or grazing. Weed suppression is tied very strongly to biomass production. The more biomass produced, the better the weed control (which is also good for grazing). At the CREC, the varieties Hancock and ND Dylan have provided high levels of kochia suppression (up to 70% under heavy kochia pressure). Variety maturity may be another consideration if the goal is to harvest the rye (i.e. hay) prior to planting. Make sure the selected variety is hardy for northern climates. If soil erosion is the primary goal, winter wheat or winter triticale may be alternative options if they are easier to acquire.

Weed suppression: Rye provides selective weed suppression, much like herbicides. The full spectrum of suppressed weeds is not yet known. At the CREC, we've seen high levels of suppression of kochia, green and yellow foxtail, and common lambsquarters. Other areas of the country have reported moderate suppression of common ragweed and pigweed species and high levels of suppression of horseweed. Rye has little or no effect on several legume or mint species. This is why soybeans do well with rye. Soybeans, dry beans, field peas, black medic, and lanceleaf sage have been observed growing with rye with no apparent adverse effects. As discussed above, some varieties are better than others at providing weed suppression. Typically, rye does not prevent weed emergence. There may be less weeds present, but the biggest effect is that rye stunts weeds. Kochia has been observed remaining less than 2" tall up until rye reaches anthesis. Once rye reaches anthesis, the weed suppression disappears and the weeds will begin to grow as normal.

Planting date: Rye has a wide range of possible planting dates. Optimum time of planting for biomass production is going to be mid-to late September, but can be extended into the fall until near soil freeze-up. This provides the opportunity to seed rye after corn harvest in some years. The disadvantage of planting late is that there will be less biomass and the rye will be less vigorous and mature later. Higher seeding rates would be recommended for late plantings.

Seeding rate: Seeding rate will vary greatly depending on your goals. If weed suppression is a high priority then higher seeding rates and stand uniformity are needed. When there are gaps in rye stand, there will be more weeds. Because of this, aerial seeding is not the best seeding method for weed management. We typically use 60 lb (~1 bu/ac) seeding rate for weed control. If reducing erosion is the highest priority, the seeding rate is much more flexible. Lower rates can be used and aerial seeding could be considered. Some have used as low as 30 lb/ac with reasonable success for the latter goals. Aerial seeding typically requires higher seeding rates as there is lower establishment. Once again,

when rye is planted earlier in the year, lower seeding rates could be used as there will be more tillers and more vigorous spring growth.

Termination method: Rye can be terminated several ways. Glyphosate is one of the more reliable options for termination. Use a minimum of 1 lb ae/ac of glyphosate to prevent escapes. Other effective options in soybeans would be Select/Assure II (or generics) as long as rye has not reached the boot stage. After the boot stage, Group 1 herbicides will not be effective on rye. Raptor can be effective on rye until rye heading, but there is a higher chance for escapes than glyphosate due to high inherent genetic variability to Raptor efficacy. Using a crimper roller can be as effective as many of the herbicides, but timing is very critical. Rye rolled prior to anthesis **will** recover. A land roller alone will not terminate rye. If using a land roller, pair with an herbicide application. Mowing or haying could also be considered but again, removal prior to anthesis will result in poor termination. Tillage can be used to terminate rye, but it would be the most risky method. Escapes are likely with tillage and it removes most of the benefits that rye would provide. In 2017 there were also incidents of heavy seed corn maggot pressure due to rye residue being buried.

Termination timing: This question is the most difficult to answer as it varies by year. Some years, we've seen rye and soybeans co-exist together up until rye anthesis, when the soybeans are likely planted and emerged. In other years, that same treatment has resulted in complete soybean failure in test plots. The driving factor in that difference in response is soil moisture. In years of good spring moisture, the two crops can grow as well as if there was only a single crop. In 2016 and 2017 (very dry springs), terminating rye at or after soybean planting resulted in lower soybean yields. The problem is that if rye is terminated too early, you will lose many of the benefits of rye. Weed suppression disappears within 1 week without rye growth or stubble. On the other hand, rye plus a single glyphosate application at anthesis can provide season-long weed control some years due to a living mulch effect. Keep in mind that the more advanced the growth stage of rye, the more moisture is used. Early maturing varieties tend to accumulate biomass earlier in the season. Terminating rye two weeks prior to soybean planting is generally a safe practice, even more so when paired with early soybean planting dates.

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