Fall rye termination timing in Manitoba soybean production

Changing Plans

Virginia Janzen, MSc student and Dr. Yvonne Lawley, Department of Plant Science, University of Manitoba – Fall/Winter (December) Pulse Beat 2021

Asking questions

Winter rye has a wide fall planting period and range of rates, depending on goals for the cover crop. Rye is normally planted in August through to October at rates ranging from 30 to 60 lbs/ac. A study was commenced at the Carrington Research Extension

Centre (CREC) in 2018 to examine impact of rye planting dates and rates on following year rye plant stand, ground cover, weed suppression and impact on soybean production.

Fall rye is a popular cover crop option for fall seeding in northern growing regions due to its low seed cost, seed availability, wide seeding window, quick establishment and winter hardiness. Many of the benefits connected to growing fall rye, such as erosion control and weed suppression, relate to its abundant biomass production. As a cover crop with good winter hardiness, fall rye survives the winter and can provide ground cover the following spring. This also means that fall rye cover crops require termination in the spring. Therefore, an important question for managing fall rye cover crops is when to terminate in the spring.

When looking for advice, the common recommendation for terminating fall rye is to do so 14 days prior to planting your next crop. Terminating fall rye this far in advance is intended to minimize soil moisture loss, nitrogen tie-up and allelopathic impacts that could affect the next crop that will be planted. This plan for early termination is especially important during dry spring conditions or when that next crop needs access to early nitrogen, such as wheat, canola or corn.

There may also be conditions where leaving a fall rye cover crop to grow longer is helpful. An actively growing fall rye cover crop during a wet spring could help dry the soil and improve soil trafficability for earlier planting. From a nitrogen perspective,

this strategy works best with legume crops, like soybeans, that fix their own nitrogen. There has been increasing interest from farmers using cover crops to “seed green” with legume crops into a living fall rye cover crop.

Weather can always throw a wrench into our well-intentioned plans. What could happen if your plan to terminate 14 days before planting is forced to change? For example, rain may prevent field access for a timely glyphosate application to terminate the fall rye cover crop. Or seeding for other spring crops may change your priorities for labour and equipment and again delay termination. When adopting any new practice, it is important to have Plan A and B at the ready to allow you to adapt to changing conditions.

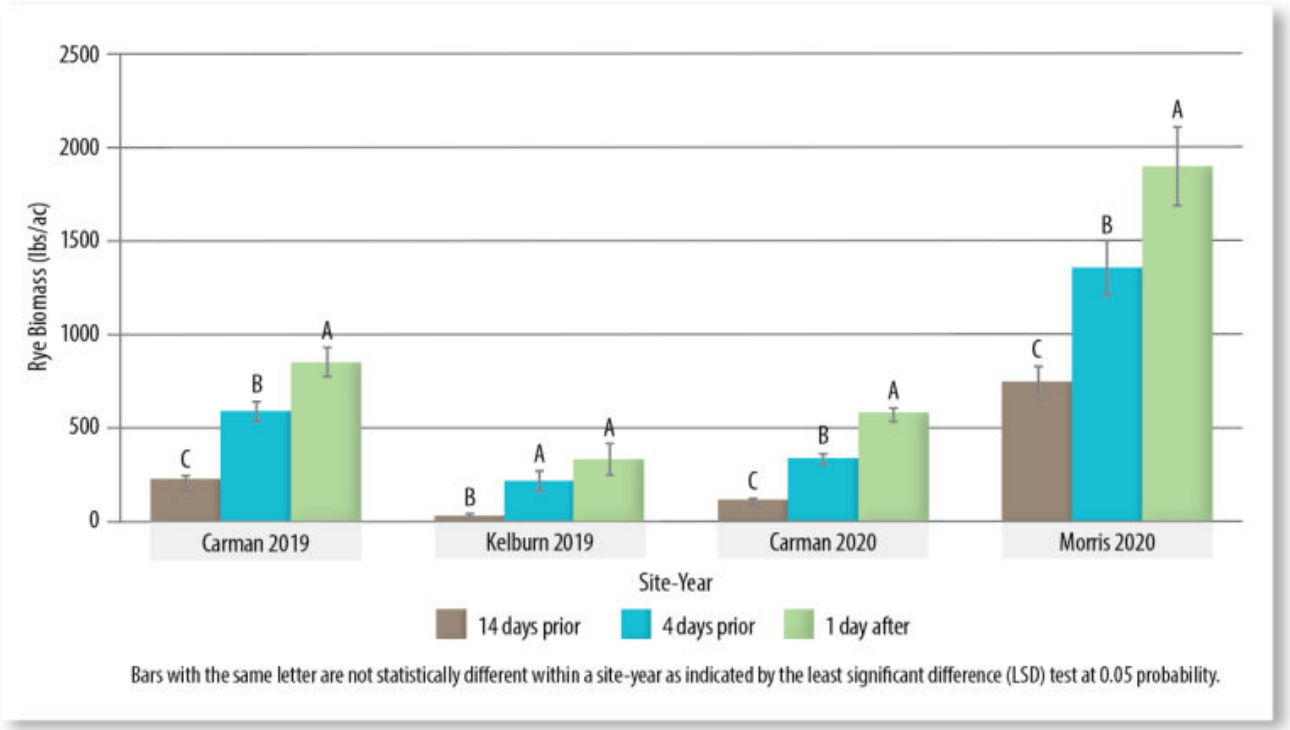
It was time to look at these questions about fall rye termination timing ahead of planting soybeans under Manitoba growing conditions. We conducted a small-plot study at two sites with contrasting soil types (loam soil at Carman and clay soil at Kelburn) in 2019 and two sites (loam soil at Carman and clay soil at Morris) in 2020. We tested the recommended termination timing of fall rye (14 days prior to soybean planting) and compared it to two later termination dates (four days before soybean planting, one day after soybean planting), as well as a control treatment with no fall rye. The Carman and Kelburn sites used open-pollinated fall rye seeded at approximately 70 lbs/ac, while the Morris site used hybrid fall rye seeded at 60 lbs/ac. Fall

rye was seeded between September 11 and September 18 into canola stubble at all sites.

What we found

One of the first measurements we took was how much the fall rye grew between termination dates. As termination timing was delayed, biomass increased from 14 days before to one day after soybean planting (Figure 1). Biomass of open-pollinated fall rye at Carman 2019, Kelburn 2019 and Carman 2020 was minimal when terminating at the recommended timing of 14 days before planting. The hybrid fall rye grown in Morris 2020 had greater spring growth and biomass for all termination dates (Figure 1).

Figure 1. Fall rye biomass at three termination timings relative to the soybean planting date.



The pictures in Figure 2 show you what seedbed conditions looked like on the day of soybean planting for the range of fall rye termination dates that we tested in the study. Among the treatments, there were really four different types of seedbed conditions: (1) the control treatment with canola stubble but no fall rye; (2) fall rye that was completely dead; (3) fall rye that was dying; and finally (4) fall rye that was still actively growing.

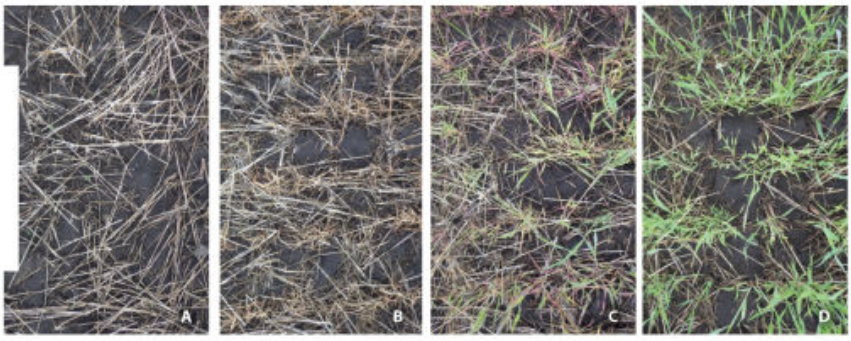
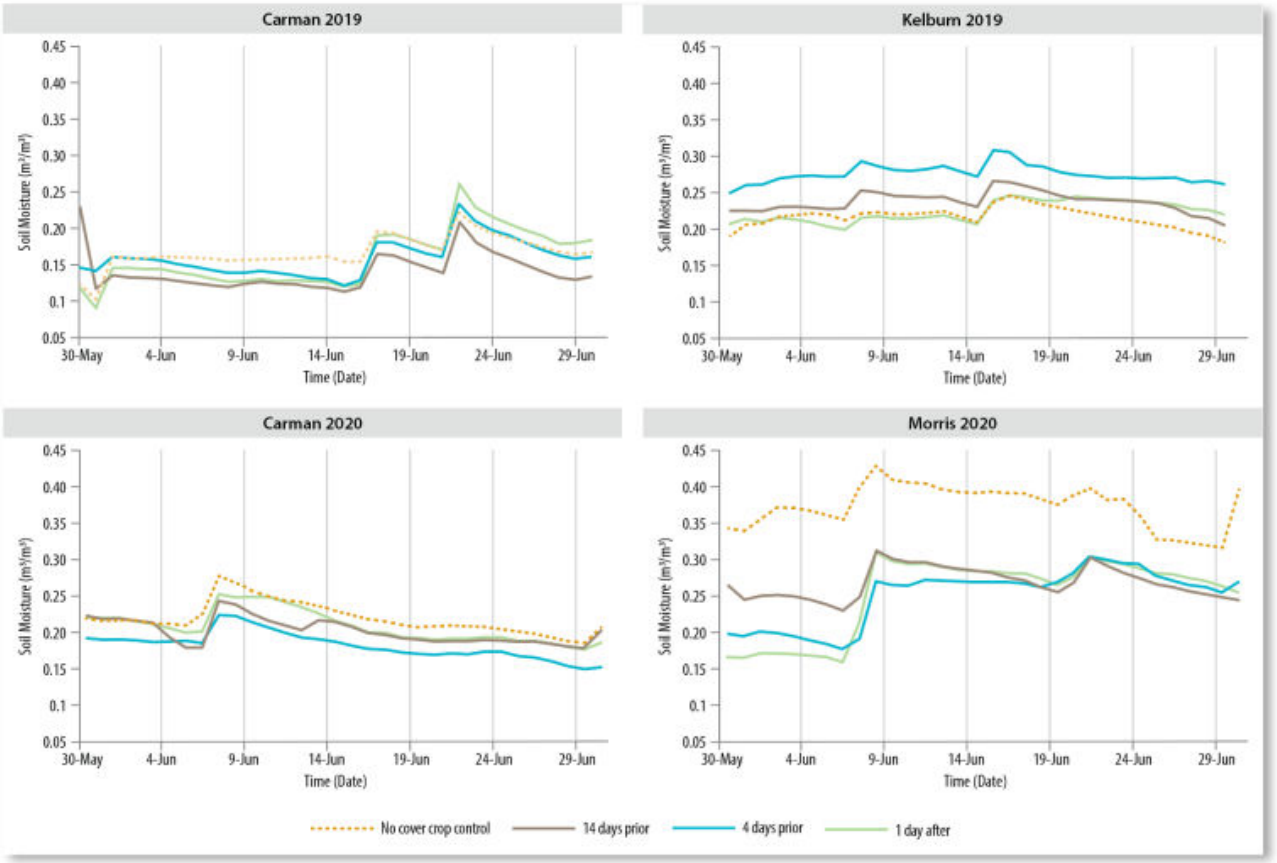


Figure 2. Ground cover provided by canola stubble and dead or living fall rye cover crops taken the day of planting at Carman 2020. Left to right: (a) control plot with no fall rye (b) fall rye terminated 14 days before planting (c) fall rye terminated four days prior to planting, and (d) living fall rye that will be terminated one day after planting.

Fall rye termination treatments affect soil moisture at seed depth (5 cm) after planting, but the trends seen were also influenced by the environmental conditions. In 2019, both site-years were dry at seeding and precipitation remained below the long-term average through June. The 2020 site-years were also dry at seeding, but precipitation was closer to the long-term average in June. As seen in Figure 3, soil moisture was similar among fall rye termination date treatments at both Carman sites, with the no cover crop control treatment generally having higher soil moisture. In Kelburn 2019, the fall rye treatments generally had more soil moisture at seeding depth compared to the no cover crop control. At Morris in 2020, the higher biomass from the hybrid fall rye cover crop resulted in a larger difference in soil

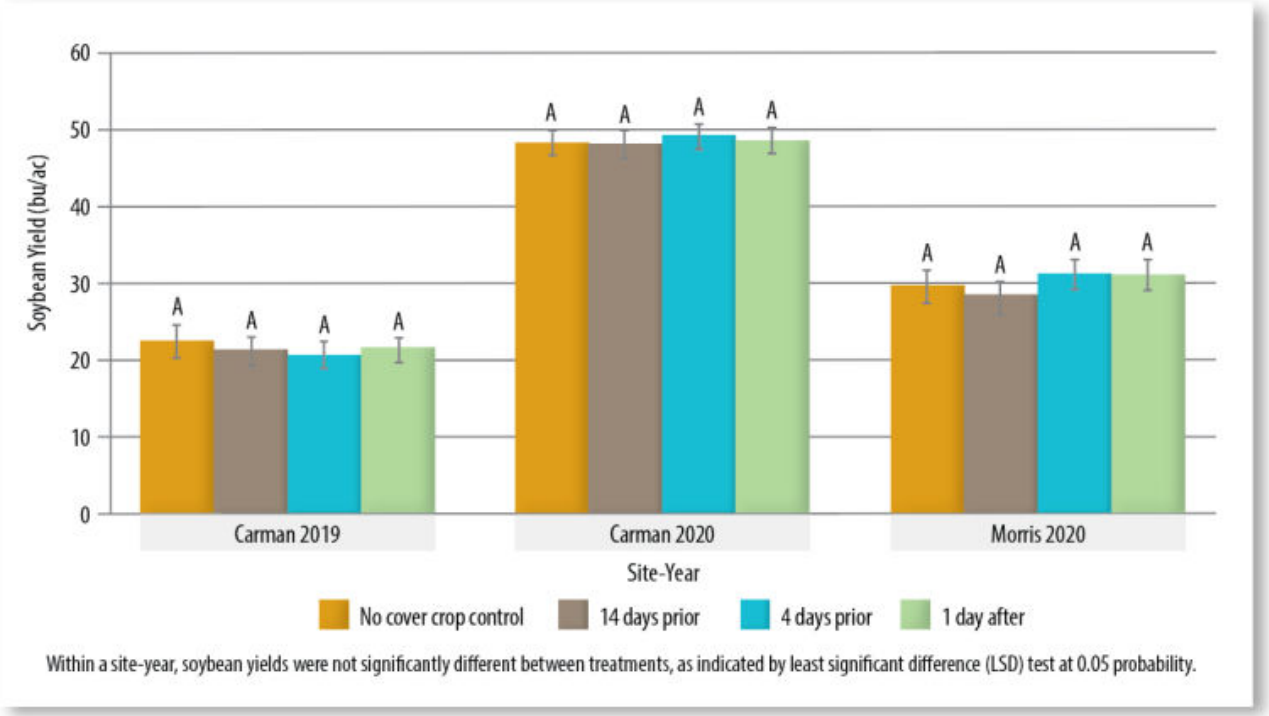
moisture between the control and all the fall rye termination treatments. Soil moisture in the control treatment remained higher throughout the entire month, even after rainfall events. Under dry conditions, this extra water used by the hybrid fall rye with more biomass was not desired. This highlighted that growing a thinner stand of fall rye with less biomass or terminating the cover crop early is important for managing cover crops in dry conditions. Looking at these results with a normal to wet spring in mind, it is easy to see the potential for using fall rye cover crops with sufficient biomass to dry the soil for improved trafficability and earlier planting.

Figure 3. Soil moisture measured at seeding depth (5 cm) for three fall rye cover crop termination timings and the no fall rye control. Soil moisture was measured for thirty days after soybean planting at (a) Carman 2019; (b) Kelburn 2019; (c) Carman 2020; and (d) Morris 2020.



One big question remains, what was the impact of these cover crop treatments on soybean yield? Unexpectedly, there was no soybean yield difference between the control treatment and the fall rye cover crop treatments (Figure 4, note that the Kelburn 2019 soybean yield data was lost due to deer damage). There was also no difference among the three fall rye termination treatments in the study. Although the experiments occurred during dry years where soybean yields were limited, it was interesting to learn that there could be more flexibility in spring termination timing for fall rye when soybeans follow in rotation.

Figure 4. Soybean yield after fall rye terminated at different spring timings relative to soybean planting.



Summary

Reducing the potential for soil erosion before and after low residue crops like soybeans is important in Manitoba. The most

common goal for using cover crops is to improve soil health. This experiment did not lower yields by using cover crops to protect soil from potential spring erosion ahead of soybeans. This research suggests that we have the flexibility to terminate fall rye cover crops from 14 days before planting all the way to the day after planting without negatively impacting soybean yield. Thus, if and when spring termination plans for fall rye cover crops need to change before planting soybean, there may be little cause for concern.

Measuring soil moisture at seeding depth under dry conditions during these experiments confirmed that limiting the spring growth of fall rye can lessen the drying out of surface soils. In this experiment, where the growth of open-pollinated fall rye was minimal, there was a limited effect of fall rye on soil moisture available at seeding depth for the emerging soybean crop after planting. One day, when wetter conditions return to Manitoba, this experiment has also demonstrated the potential to manage fall rye cover crop biomass in order to dry soils ahead of soybean planting. In this study, the use of hybrid fall rye in one site-year produced more biomass at all termination timings and lowered soil moisture in the seeding zone relative to the no cover crop control treatment. Despite differences in soil moisture, this did not translate into soybean yield deficits.

If these results have piqued your interest, we recommend starting small with a few acres or a small field. Try terminating your first

fall rye cover crop 14 days before planting soybeans. As you gain more experience, then try terminating a bit later when there is good spring soil moisture so you can gain experience with the equipment and conditions on your farm.

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