SOIL HEALTH

Residue Management Before Growing Soybeans

Tillage or straw removal from no-till cereal stubble resulted in warmer and drier seedbeds, but this had little effect on emergence or yield when soybeans were planted into soils at ≥15°C.

SOYBEANS ARE SENSITIVE to cold temperatures during early development. It is recommended to plant soybeans when daily average soil temperatures are above 10°C. Residue management before soybean planting may be one tool to modify early-season soil conditions for better plant establishment, especially in short-season areas like western Manitoba.

The objective of this research was to determine if residue management practices ahead of soybeans would have an impact on soil temperature and moisture at planting, or on soybean emergence, yield and quality.

Six residue management treatments were assessed at Brandon, Carberry, Portage and Roblin over three years (2015 to 2017). Residue management treatments included: 1) tilled wheat residue, 2) wheat straw chopped and returned, 3) wheat straw removed, 4) oat straw chopped and returned, 5) oat straw removed and 6) canola straw chopped and returned.

Soybeans were planted from mid- to late-May. Soil temperature and moisture at seeding depth were measured at planting. Days to emergence, plant stand and yield were evaluated.

Soil temperatures at planting ranged from 15°C to 25°C, regardless of the residue management treatment (Figure 1).

Tillage increased soil temperature compared to no-till treatments, on average, by 1°C to 5°C (7 of 12 site-years). Tillage generally reduced (6 of 12 site-years) or had no effect on soil moisture (6 of 12 site-years) compared to no-till treatments. Straw removal increased soil temperature by <1°C to 3°C (7 of 12 site-years) and reduced soil moisture (5 of 12 site-years) compared to no-till treatments with straw. Canola stubble with straw returned had a more variable effect with no clear trend observed.

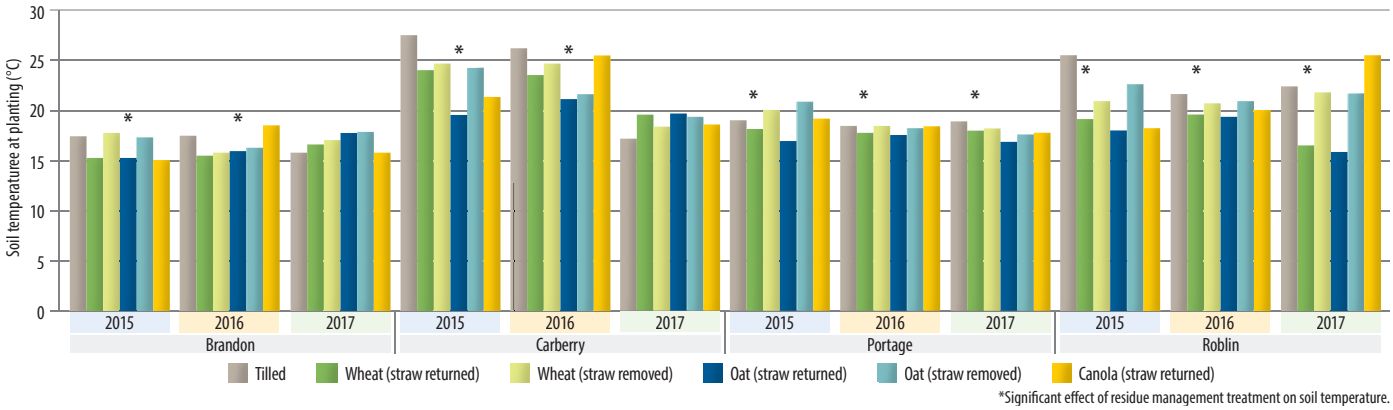
Based on a visual assessment, days to emergence were similar regardless of residue management treatment. There was also no significant effect on plant stand from emergence to 30 days after planting.

Soybean yield was unaffected by residue management practices at 10 of 12 site-years. At Brandon in 2017, the tilled treatment yielded more than other treatments (3.5 bu/ac more), but no difference in soil temperature or moisture at planting was measured. At Brandon in 2016, yield was 6.6 bu/ac more following canola than wheat with straw removed. This may have been due to the higher rate of nitrogen fertilizer applied in the spring to compensate for lower soil test N following canola.

Temperature differences at planting may not have been great enough to influence crop performance, or soybeans were able to compensate for any small differences throughout the growing season. Soil temperatures at planting were ≥15°C in all treatments and soybeans were planted during the recommended planting window. Under more marginal growing conditions with earlier planting dates and cooler temperatures, there may be an effect of residue management practices on soybeans.

To assess this, a follow-up study was started in 2017 to determine if there is an effect of residue management when soybeans are planted into marginal conditions and under additional residue management practices (tall vs. short stubble, stubble burning). Results are expected in 2022.

Figure 1. The effect of six residue management practices on soil temperature (°C) at planting at Brandon, Carberry, Portage and Roblin from 2015 to 2017.



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