Residue Management for Soybean Establishment in No-till Crop Systems

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Introduction

While no-tiling soybean into standing corn stalks is considered common practice by many producers in southern and central Illinois, planting no-till into corn residue, especially following high corn yields with high amounts of residue, can be challenging. It is also not known whether or not standing corn residue might provide some competition to soybean plants.

Objective

The goal of this study was to examine how corn residue management, tillage, and row spacing affects yield of soybean following corn at different sites in Illinois.

Methods

- In 2012, this study was conducted at three Illinois locations:
  - Urbana in east central Illinois
  - Brownstown in south-central Illinois
  - Dixon Springs in southern Illinois
- Study Design
  - Urbana: split-split plot
    - Residue as main plot
    - Tillage as split plot
    - Row spacing as split-split plot
  - Brownstown and Dixon Springs: split plot
    - Tillage by row spacing as main plot
    - Residue as split plot
- Three corn residue treatments:
  - Standing
  - Chopped and left on the plot
  - Chopped and removed from the plot
- Tillage treatments included conventional tillage and no-till
- Row spacings used were 38 and 76- cm.
- Experimental units consisted of four 76-cm rows or seven 38-cm rows 11 m long.
- The center two rows of the 76-cm rows and the center four rows of the 38-cm rows were harvested with a plot combine. Yields were corrected to 13% moisture.

Results

All locations were affected by dry weather from planting to early August 2012. Rainfall returned to normal thereafter, and yields were average at all three sites, averaging 2944, 3500, and 2694 kg ha^{-1} at Urbana, Brownstown, and Dixon Springs, respectively.

Table 1. ANOVA of soybean yield by location, 2012.

Fixed Effect	Urbana	Brownstown	Dixon Springs
Residue	NS†	*	NS
Tillage	*	NS	NS
Row Spacing	**	NS	NS
Res*Till	NS	NS	NS
Res*Row	NS	NS	NS
Till*Row	NS	NS	NS
Res*Till*Row	*	NS	NS

* Significant at $P = 0.1$
** Significant at $P = 0.05$
† NS = not significant at $P = 0.1$

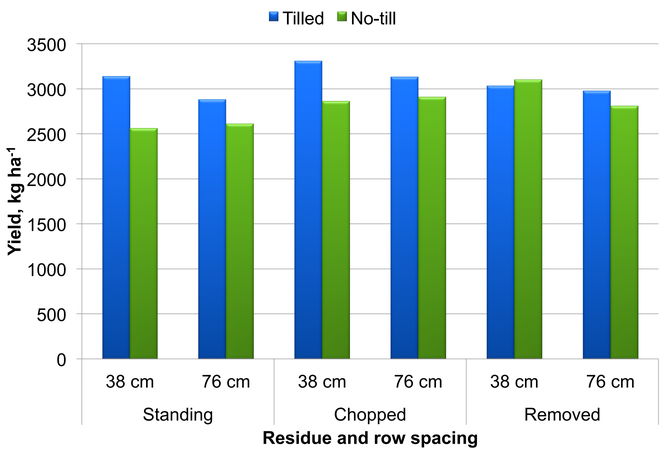

Figure 1: Effect of residue, tillage, and row spacing at Urbana.

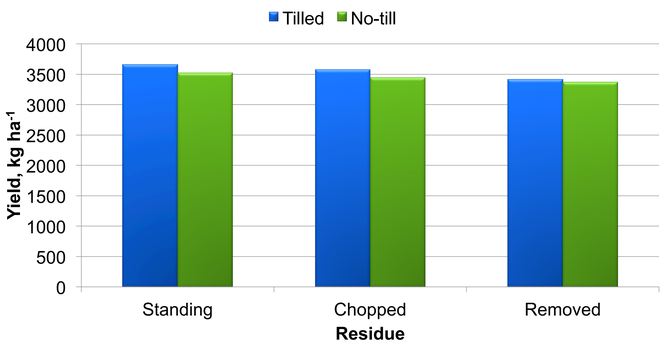

Figure 2. Yields with residue management and tillage at Brownstown.

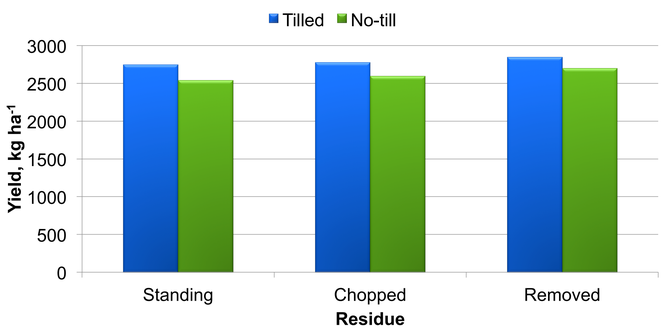

Figure 3. Yields with residue and tillage At Dixon Springs.

Summary

Urbana

- Residue management did not significantly affect soybean yield, but the interaction of residue management, tillage, and row spacing was significant. The responses to tillage and row spacing were different depending on the residue treatment.
- When residue was left standing or chopped and left on the plot, tilled plots yielded more than no-till plots. When residue remained on the plots, 38-cm rows yielded more than 76-cm rows. A different response was seen when residue was removed from the plot: 76-cm rows yielded 291 kg ha^{-1} less than 38-cm rows under no-till. The differences between tillage and no-till were not significant when residue was removed.
- No-till soybeans yielded 270 kg ha^{-1} less than those that were conventionally tilled.
- Soybeans in 38-cm rows yielded 114 kg ha^{-1} more than those in 76-cm rows.

Brownstown

- Soybean in standing residue yielded 199 kg ha^{-1} more than when residue was removed. Chopping the residue but leaving it in place produced yields intermediate to those in standing and removed residue.

Dixon Springs

- Soybean yields were not affected by residue management or tillage.

Conclusions

No-tilling soybean into standing corn stalks is considered normal practice by many producers, especially in southern Illinois. These results do not cast great doubt on the soundness of this practice; in fact, removing residue at Brownstown actually lowered yields in a dry year, probably because of better moisture retention, but had no effect at Dixon Springs. Lower yields at Urbana under no-till and with residue present were a surprise, and might have been related to the unusual dryness early in the season, possibly to some reduction in interference with seed placement provided by residue removal, and to a decrease in soil compaction from tillage.

Acknowledgments

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