Does Strip Tillage or Fertilizer Placement Influence the Soybean Row Spacing Yield Response?

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Introduction

Strip tillage adoption in corn [*Zea mays* (L.)] and soybean [*Glycine max* (L.) Merr.] production has increased as a means to alleviate cold, compacted soils in rotated corn production systems. Potential agronomic benefits include earlier planting dates, warmer soil temperatures, and greater fertilizer efficiencies, while less soil disturbance and fertilizer incorporation are environmentally appealing. Soybean has the ability to benefit from strip tillage; however, soybean yield response to strip till has tended to be less consistent than in corn (Griffith et al. , 1994)

The Objective of this study is:
Quantify the effect of strip tillage and fertilizer placement on soybean stand establishment and seed yield.

Materials and Methods

Two field studies were conducted in the 2016 growing season at the Arlington Agricultural Research Station using small plots, and two large field-scale trials were established by a grower in Sharon, Wisconsin in the same year. The previous crop was corn in all trials and a RCB design with 3 or 4 replicates was used. Strip till treatments at the Arlington location were imposed using a 4 row by 76 cm spaced Remlinger strip till unit with shanks set to till 15 cm deep. At Sharon, a Kuhn Krause Gladiator strip till unit (12 row by 76 cm) was used at the same depth. All strip till treatments were performed in 76 cm spacing regardless of the soybean row spacing. Fertilizer (17 kg N ha^{-1}, 43 kg P ha^{-1}, and 147 kg K ha^{-1}) was applied either on the surface prior to strip tilling or deep banded with the strip tiller. Syngenta Brand S20-T6 soybeans were planted using a no-till planter at 345,000 seeds ha^{-1} at Arlington. In Sharon, Dairyland DSR-2909/R2Y soybeans were planted at 383,000 seeds ha^{-1}. Grain yield and moisture were determined by mechanically harvesting a 21.3 m^2 area in the small plots at maturity (R8). Harvest area in the large plots varied from 0.24 to 0.63 ha. Yields in all studies were adjusted to a moisture content of 130 g kg^{-1}.

Literature cited

Griffith, D.R., T.D. West, G.C. Steinhardt, and P. R. Hill. 1994. Strip preparation for no-till corn and soybeans. Conservation Tillage Publication CT-4. Cooperative Extension Service. Purdue University, West Lafayette, IN.

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Results and Discussion

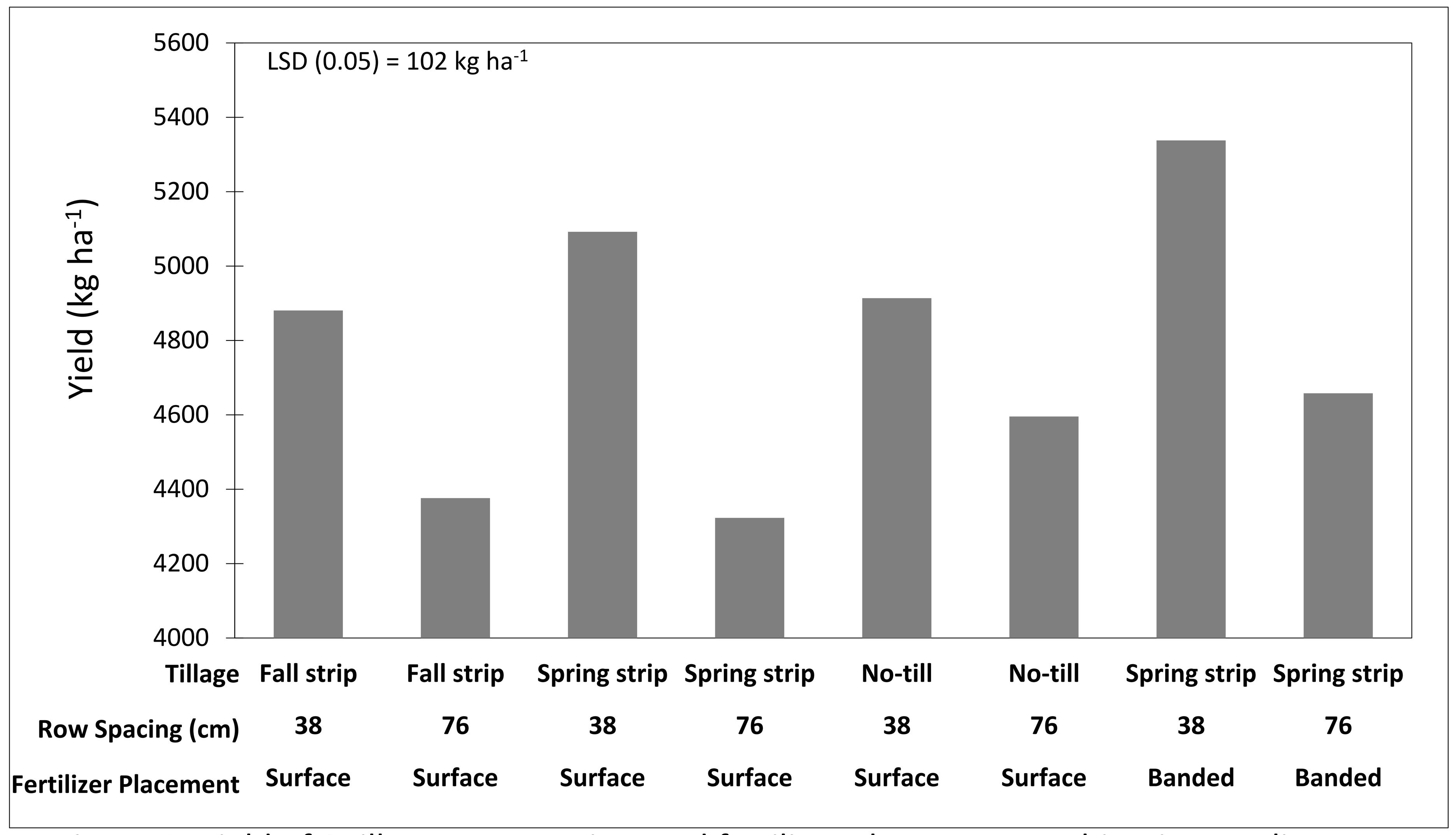

Figure 1. Yield of 8 tillage, row spacing, and fertilizer placement combinations. Arlington-1, WI. 2016.

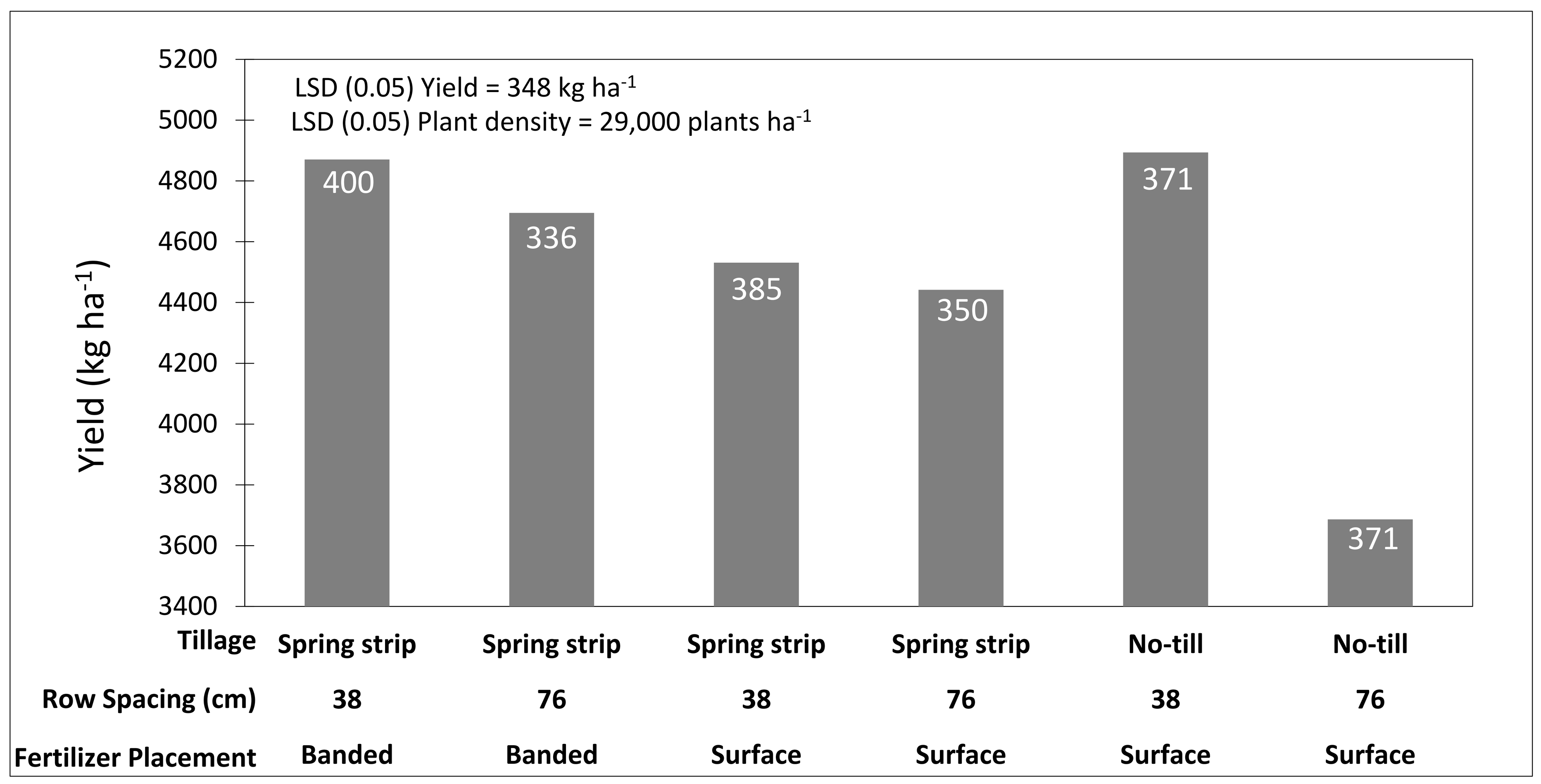

Figure 2. Yield of 6 tillage, row spacing, and fertilizer placement combinations. Early plant density shown at the top of each bar as 1000 plants ha^{-1}. Arlington-2, WI. 2016.

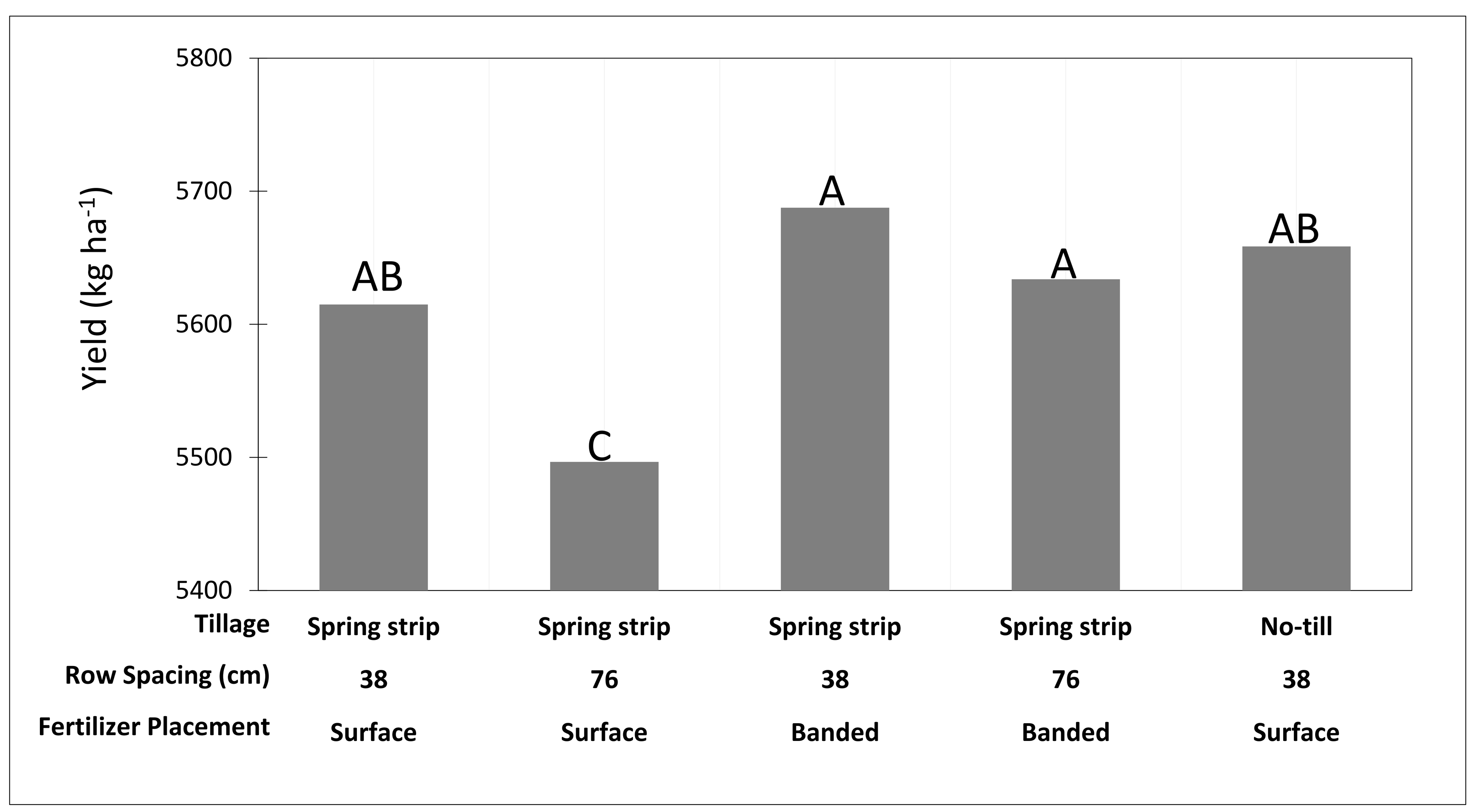

Figure 3. Yield at two field scale strip till trials. Means sharing the same letter are not significantly different from each other. Sharon, WI. 2016.

Figure 3. Early season growth of plants in strip till (ST) and non-strip tilled (NST) rows.

Figure 4. 12 row x 76 cm spaced strip till unit with fertilizer applicator.

Discussion

- Early growth of soybean rows in non-strip tilled rows were visibly less vigorous than those in the adjacent strip tilled rows in all trials.

Small plots

- 38 cm spaced rows outyielded 76 cm row spacing by 568 kg ha^{-1} (13%) in the Arlington-1 study and 491 kg ha^{-1} (11%) in the Arlington-2 trial.
- Yield from deep banding of fertilizer in spring strip till treatment outyielded surface applied applications by 6% in the Arlington-1 study and 7% in the Arlington-2 study.
- Differences in early stand establishment were detected in one study. Plant stands at V1 in the 38 cm row spacing were significantly higher than in 76 cm where strip tillage was used.

On-farm

- There was no tillage or row spacing affect on soybean seed yield. However banded fertilizer placement showed a 108 kg ha^{-1} yield advantage compared to surface applications.

Conclusions

- Exceptionally good growing conditions in 2016 may have over shadowed any advantages to strip till normally seen in colder soils. Soil temperatures were recorded in these studies (data not shown) and only small differences were found comparing no-till to strip till. These studies will be repeated in 2017.