FIELD FACTS

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Pioneer Research Update:

Variation in Corn Yield across Planter Width

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Key Research Findings

- Pioneer researchers conducted on-farm trials in 2011 to determine variability in corn yield associated with wheel traffic compaction across the width of planter passes.
- The average corn yields of the rows planted by the outside wing segments were significantly greater than those planted by the center segment at nine of the 12 trial locations.
    - Outside wing segments yielded an average of 11.3 bu/acre more than center segments across locations.
- These findings show that the variation in yield effect due to interrow compaction across the width of the planter could unfairly bias a split-planter trial.
- Growers should avoid splitting planter passes into more than two strips to ensure the most accurate possible yield comparison.

Excessive soil compaction can reduce corn yield by restricting root growth and limiting water and air infiltration. A common source of soil compaction is wheel traffic, most frequently associated with large machinery at harvest, particularly when soils are wet. However, wheel traffic compaction is also created between crop rows during planting.

Previous research has shown that soil compaction does not have to be directly on top of a row to impede plant growth and that compaction created in the interrows at planting can decrease yield. Research conducted in the early 1990s on effects of interrow wheel traffic on corn yield showed that rows with no wheel traffic in the adjacent interrows yielded better than those with wheel traffic in one or both of the adjacent interrows (Kaspar et. al, 1995).

Larger and heavier equipment increases the potential for compaction at planting. Compaction also tends to be more variable in the field with wider planters since the tractor wheel tracks are impacting a smaller proportion of the total planter pass width. Center fill planters may exacerbate this effect by further concentrating wheel traffic weight in the center of the planter pass.

Research Objectives

In 2011, DuPont Pioneer conducted 12 on-farm trials in Minnesota looking at variability in corn yield associated with wheel traffic compaction across the width of planter passes.

The objectives of this study were to:

1. Evaluate corn yields across the width of large modern planters; comparing the center segment, where wheel traffic is concentrated, to the outer wing segments
2. Determine implications for best practices when setting up split-planter trials

Study Description

Location and Treatments

Twelve field-length strip experiments were conducted on farms in southern Minnesota in 2011 (Figure 1). A single hybrid was used across the entire trial within each location. The number of replicates varied by location, from 3 to 18. All trials were harvested using a corn head that was one-third the width of the planter. The two outside one-third planter passes (or the wing segments) were harvested and their mean yield compared to the inside one-third planter pass (or the center segment). It should be noted that after the planter pass, the center segments may have had additional wheel traffic (e.g., sprayer pass, fertilizer pass, etc.) that was not characterized as part of this study.

Planter Configurations

Three different planter configurations were included in this study:

- 36 rows, 22-inch spacing, center fill (3 locations)
- 48 rows, 20-inch spacing, row-unit boxes (4 locations)
- 36 rows, 20-inch spacing, center fill (5 locations)

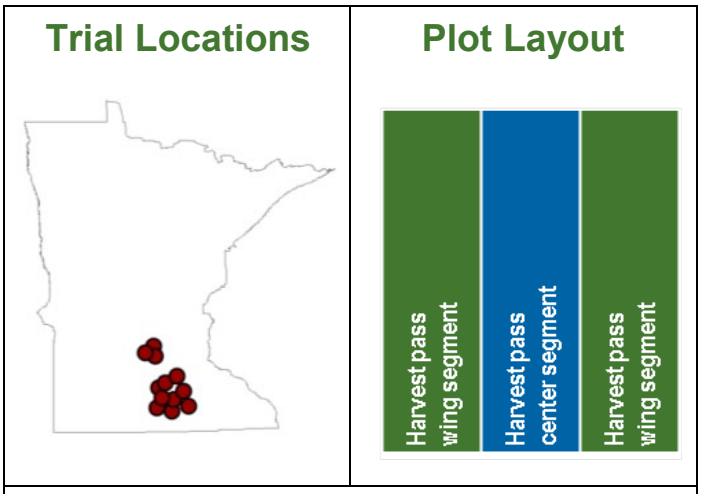

Figure 1. Trial locations and plot layout of planter width yield trials conducted in southern Minnesota in 2011. Number of replications varied by location.

Results

Results from this study showed that corn yield varied across planter width. The average corn yields on the outside wing harvest passes were significantly greater than those of the center harvest passes at nine of the 12 trial locations. The difference in yield between the outside wing passes and center passes varied by location, and the average across all locations was 11.3 bu/acre (Figure 2). The variation in yield effects across locations was not unexpected; because the degree of soil compaction caused by wheel traffic varies with soil moisture, the yield impact of wheel traffic at planting should vary among environments based on soil conditions.

It is important to note that all of the locations in this study were planted in narrow rows (20 and 22 inches). Because corn planted in narrow rows is in closer proximity to a compacted wheel track in the interrow, it is possible that that overall yield effect of wheel traffic compaction at planting could be greater in narrow rows than in 30-inch rows.

Conclusions

Results from this study confirm findings of previous research showing that soil compaction created in the interrows at planting can reduce corn yield in the adjacent rows, creating variability in yield across the width of the planter.

Unfortunately, aside from avoiding planting when soils are too wet, there is often little growers can do to reduce interrow compaction at planting. However, it is important to be aware of the potential yield effects when conducting a split-planter comparison. If the planter is divided into three or more strips, which may be convenient with the size of modern planters, the results from these trials may be unfairly biased due to the differential impact of wheel traffic among the strips. Consequently, growers should avoid splitting planter passes into more than two strips to ensure the most accurate possible yield comparison.

References

Carter, Paul. 1996. Wheel Traffic Between Corn Rows Crop Insights, Vol. 6, No. 22. Pioneer Hi-Bred, Johnston, IA.

Kaspar, T.C., S.D. Logsdon, and M.A. Prieksat. 1995. Traffic pattern and tillage system effects on corn root and shoot growth. Agron. J. 87:1046-1051.

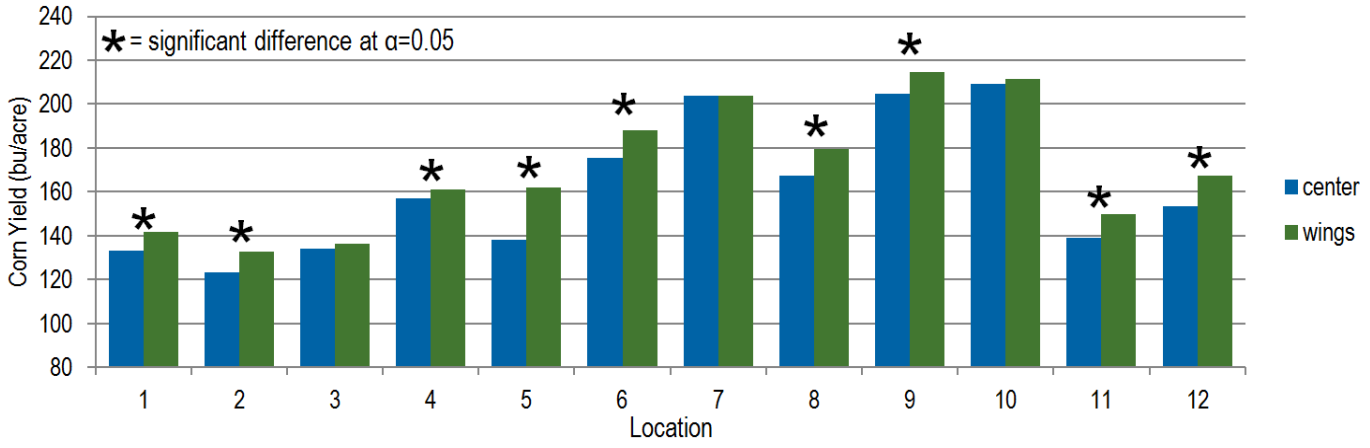

Figure 2. Corn yield difference between wing harvest passes and center harvest passes in 12 on-farm field-length strip trials conducted in southern Minnesota in 2011. Asterisks denote locations where yield was significantly different between wing and center harvest passes.