Corn Grain Yield Response to Preplant Placement of Nitrogen at Different Distances from the Row

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Introduction

- Corn root growth increases when nitrogen (N) is applied next to the row
- Grain yield and fertilizer uptake have been found to increase by not placing fertilizer in areas with machinery traffic
- RTK-GPS can provide repeatable sub-inch accuracy that can optimize fertilizer placement
- Previous research in OK has shown yield and NUE increase by placing sidedress N closer than 20 cm to corn row.

Objective

- To evaluate the effect of preplant N distance placement from the row on corn grain yield and grain N content

Figure 1. Preplant N applicator applying UAN (28-0-0) with coulters shifted for 38 cm distance from planned corn row.

Materials & Methods

- 5 site-years in Oklahoma
  - 2009 Lake Carl Blackwell – Irrigated
  - 2009 Lake Carl Blackwell – Dryland
  - 2012 Hennessey
  - 2012 Lake Carl Blackwell
  - 2013 Hennessey
- All N applied preplant as UAN (28-0-0)
- Two rates of N placed in a band 15 cm deep at 0, 8, 15, 25, and 38 cm from the corn row
- A check (0 kg N ha^{-1}) and high N reference (224 kg N ha^{-1} applied 15 cm from row) were also utilized
- Corn was planted using the same "A-B" line with RTK-GPS
- Treatments arranged in a RCBD with 3 replicates

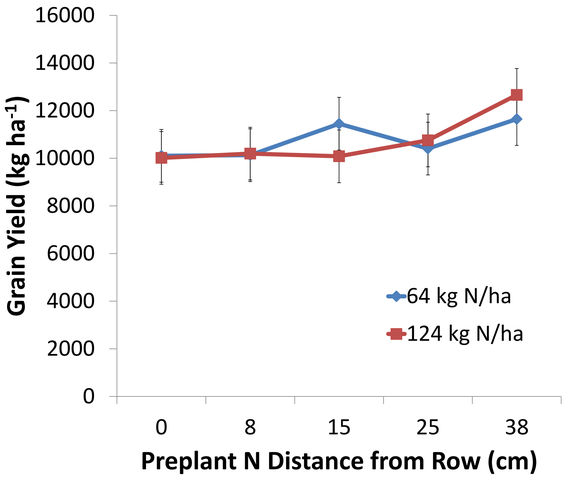

Figure 2. Corn grain yield response at 64 and 124 kg N ha^{-1} to preplant N placement from the row, Lake Carl Blackwell - Irrigated, 2009. Bars represent standard error.

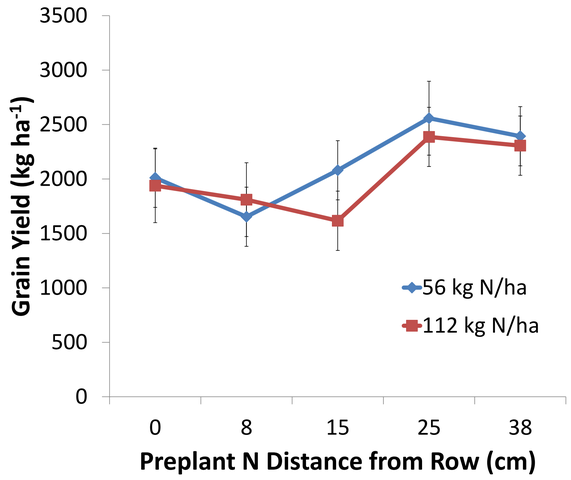

Figure 4. Corn grain yield response at 56 and 112kg N ha^{-1} to preplant N placement from the row, Hennessey, 2012. Bars represent standard error.

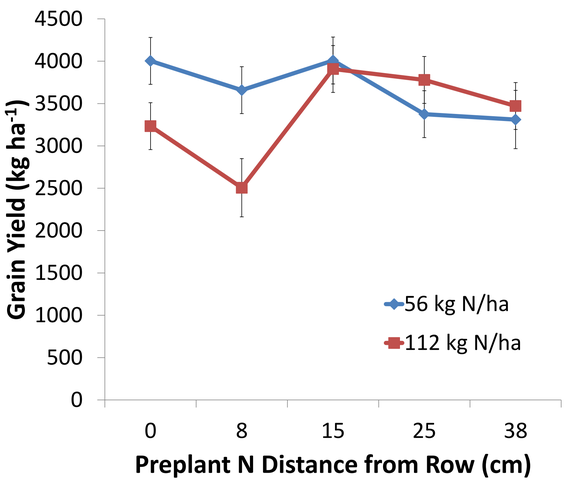

Figure 6. Corn grain yield response at 56 and 112kg N ha^{-1} to preplant N placement from the row, Hennessey, 2013. Bars represent standard error.

Results

2009 LCB – Irrigated

- Quadratic yield response to applied N
- No yield difference between N rate across distances (Fig. 2)
- Higher grain N % at all distances with 124 kg N ha^{-1} (Fig. 3)
- Across N rate, grain N % follows cubic trend

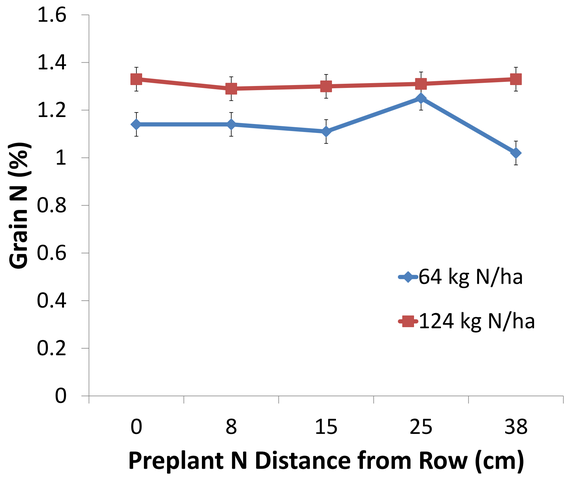

Figure 3. Corn grain N content response at 64 and 124 kg N ha^{-1} to preplant N placement from the row, Lake Carl Blackwell - Irrigated, 2009. Bars represent standard error.

2012 Hennessey

- Drought limited yield and N response
- Linear trend for grain yield to increase with distance (Fig. 4)
- Significant treatment effect on grain N %
- Quadratic grain N % increase with N rate applied at 15 cm
- No observed grain N % response to distance placement (Fig. 5)

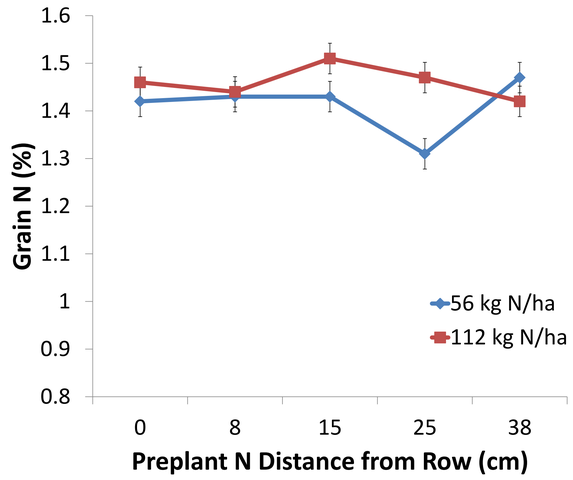

Figure 5. Corn grain N content response at 56 and 112 kg N ha^{-1} to preplant N placement from the row, Hennessey, 2012. Bars represent standard error.

2013 Hennessey

- No observed yield response to N, check had highest yield (4269 kg ha^{-1})
- Reduced yields for 112 kg N ha^{-1} applied closer than 15 cm (Fig. 6)
- No reduction in plant stands from distance applied N
- Significant grain N % response to treatment, inverse of grain yield (Fig. 7)

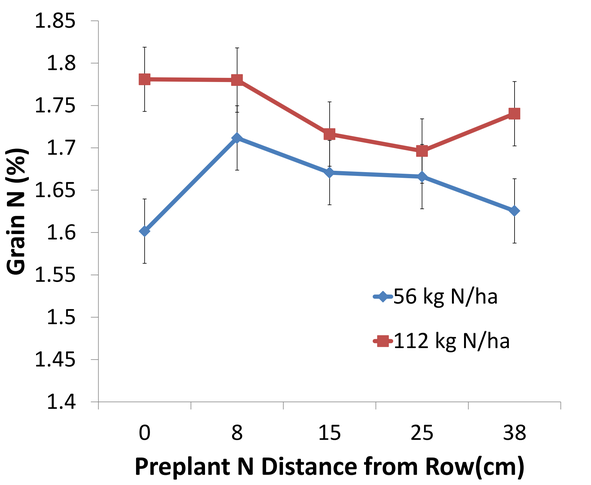

Figure 7. Corn grain N content response at 56 and 112 kg N ha^{-1} to preplant N placement from the row, Hennessey, 2013. Bars represent standard error.

Conclusions

- 2 of 5 site-years –80-112 kg N ha^{-1} applied < 15 cm from row reduced grain yield
- Grain yield response to distance placement of N dictated by environment (rainfall and root growth)
- Limited response of grain N % or grain N uptake to distance placement of N (1 site-year)

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