**Introduction**

- Water and fertilizer are expensive inputs for irrigated corn (Zea mays L.).
- Subsurface drip irrigation (SDI) systems have a 95 to 99% application efficiency and can decrease net irrigation needs of the crop by 25% (Lamm and Troien, 2003).
- Nitrogen (N) fertilizer is used more efficiently when applied closer to the time of crop uptake at V8 to V10 (Binder et al., 2000).
- Chlorophyll (SPAD) meters can be used to determine when N is needed by the crop based on leaf greenness, which is correlated to the amount of chlorophyll that is present (Samborski et al., 2009).

**Objectives**

- To increase yield and efficiency of irrigated corn production by managing N fertilizer through SDI fertigation systems that allow application at later developmental stages
- To evaluate the efficiency of using a SPAD meter to determine N applications

**Materials and Methods**

- **Experiment site:** Ashland Bottoms Research Farm, Manhattan, KS
- **Belvue (5-18% clay, 15-75% sand) and Eudora silt loam soils (5-18% clay, 10-50% sand)
- **Randomized complete block design with four replications
- **Plots 8 rows wide (20 ft.) x 200 ft. long
- **No-till, soybean-corn rotation
- **114-day relative maturity hybrid, DKC64-69RB
- **Planting dates: May 7, 2014 and April 17, 2015
- **Seeding rates: 30,000 seeds acre⁻¹ in 2014, 36,000 seeds acre⁻¹ in 2015
- **Subsurface drip irrigation (SDI) system (Netafim USA, Fresno, CA)
  - Drip tapes 15 in. deep on 30 in. spacing
  - Zones 20 ft. wide x 220 ft. long
  - Five fertilization treatments (Table 1)
  - All N applied as 28% UAN: injected just below the surface residue at planting or metered through the SDI system V5-R2

**Results**

**Yield**

![Figure 1](image1.png)

Figure 1. Key corn growth stages and precipitation, irrigation, and fertigation amounts and timing in 2014 and 2015.

- Net rainfall and irrigation: 20.3 in. for 2014, 18.9 in. for 2015 (Figure 1)

**Grain NUE**

![Figure 2](image2.png)

Figure 2. Grain yield (15% moisture) and nitrogen use efficiency of treatments in 2014 and 2015; bars with the same upper or lowercase letter are not different α = 0.10.

- The effect of N fertilizer treatments on yield and fertilizer NUE was relatively consistent across both years (Figure 2)
- Yields and grain NUE were greater in 2014 than in 2015
- Across years, grain yield was greatest in Reference the SDI Maximum treatments and lowest in Preplant Surface
- Grain NUE was greatest in the SDI Sidedress treatment and least in the Reference for both years
- Preplant Surface produced the least grain and had intermediate NUE
- SDI Sidedress had greater yield than Preplant Surface and maximized NUE
- SDI Sensor had intermediate yield and NUE
- SDI Maximum and Reference produced the greatest yields, but fertilizer NUE was similar or reduced compared to Preplant Surface

**Conclusions**

- Method, timing, and amount of N applied influenced yield and NUE
- Fertigation through the SDI system improved yields and NUE compared to preplant surface applications of UAN injected below surface residue
- Applying a greater amount of N through early grain fill increased yield, but NUE was reduced
- Efficiency of fertilizer N use was maximized when N was applied before the reproductive stages, though yield was not maximized
- Using SPAD meter readings to determine when the crop needed N applications did not improve yield or efficiency of fertilizer use in this study

**References/Acknowledgments**


**Table 2. Corn response to N application treatments in 2014 and 2015.**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Days to silk harvest</th>
<th>Grain moisture (%)</th>
<th>Test weight (bu/acre)</th>
<th>Seed weight (bu/acre)</th>
<th>Grain protein (%)</th>
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<td>Preplant Surface</td>
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<td>57.5</td>
<td>1016</td>
<td>7.3b</td>
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<td>57.7</td>
<td>1090</td>
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<td>1608</td>
<td>8.0a</td>
</tr>
</tbody>
</table>

†Values within a column followed by the same letter are not different α = 0.10.

- Days to silk, harvest grain moisture, and seed weight were not affected by N fertilizer treatments (Table 2)
- Test weight did not respond to N application method and timing in 2014, but was greater for the Reference treatment compared to the other treatments in 2015
- Grain protein increased with greater N applications through early grain fill
  - In 2014, SDI Maximum and Reference treatments had higher grain protein than the Preplant Surface, SDI Sidedress, and SDI Sensor treatments
  - The Reference treatment resulted in higher grain protein in 2015 than the rest of the treatments