In-Season N Applications for Corn: Pros and Cons

MI SWCS Seminar
March 2, 2018
Effect of N application rate on corn grain yield along with return to N and N recovery in the whole plant at R6 for each 40 lb/a increment of N fertilizer at Arlington, 2014

<table>
<thead>
<tr>
<th>N Application Rate, lb N/a</th>
<th>Corn Yield, bu/a</th>
<th>N Recovery, %</th>
<th>Return to N, $/a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>167</td>
<td>$67</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>190</td>
<td>$60</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>211</td>
<td>$60</td>
</tr>
<tr>
<td></td>
<td>160</td>
<td>228</td>
<td>$46</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>231</td>
<td>$4</td>
</tr>
</tbody>
</table>

PFP, bu/lb N
- 4.8
- 2.6
- 1.9
- 1.4
- 1.1

lb N/bu
- 0.21
- 0.38
- 0.53
- 0.69
- 0.89

AE, ∆bu/lb N
- 0.58
- 0.55
- 0.51
- 0.40
- 0.29

AE a true measure of fertilizer NUE, accounts for soil N supply.
Corn yield response in MI
previous crop = soybean
Split/Late Applications To Corn: Should I Be Using Them?
Study Background

**N Timing**
- Preplant: PP
- Sidedress: SD
  - V6, ~18”
- Split: 40PP + SD
- Preplant + Late: PP + 40L
  - Late = 10 d before VT
- Triple split: 40PP + SD + 40L

**N Sources**
- Preplant: urea broadcast, incorporated
- Sidedress: UAN sub-surface band between rows
- Late: UAN with Agrotain surface band between rows

**Locations**
- Lancaster, well drained
- Marshfield, somewhat poorly drained

**Previous crop = corn**

Research funded by Wisconsin Fertilizer Research Program
Lancaster

![Graph showing yield vs. total N application rate for 2014 and 2015.]

- **2014**
  - PP
  - SD
  - 40PP+SD

- **2015**
  - PP
  - SD
  - 40PP+SD

Yield, bu/a vs. Total N Application Rate, lb N/a
Lancaster

<table>
<thead>
<tr>
<th>Year</th>
<th>EONR, lb/a</th>
<th>Yield, bu/a</th>
<th>NUE @EONR, Δbu/lb N</th>
<th>Return to N, $/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>181</td>
<td>203</td>
<td>0.49</td>
<td>252</td>
</tr>
<tr>
<td>2015</td>
<td>116</td>
<td>185</td>
<td>0.73</td>
<td>257</td>
</tr>
<tr>
<td>2016</td>
<td>162</td>
<td>219</td>
<td>0.67</td>
<td>325</td>
</tr>
</tbody>
</table>
Marshfield, 2014

- 40PP+SD+40L sig. less yield at 120 lb/a
- Otherwise no yield difference between timings

- wet May-June, dry July, wet Aug

<table>
<thead>
<tr>
<th>Timing</th>
<th>EONR, lb/a</th>
<th>Yield, bu/a</th>
<th>NUE @EONR, Δbu/lb N</th>
<th>Return to N, $/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>179</td>
<td>185</td>
<td>0.58</td>
<td>301</td>
</tr>
</tbody>
</table>
Marshfield, 2015

<table>
<thead>
<tr>
<th>Timing</th>
<th>EONR, lb/a</th>
<th>Yield, bu/a</th>
<th>NUE @EONR, Δbu/lb N</th>
<th>Return to N, $/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP</td>
<td>210</td>
<td>151</td>
<td>0.22</td>
<td>88</td>
</tr>
<tr>
<td>SD</td>
<td>109</td>
<td>177</td>
<td>0.66</td>
<td>214</td>
</tr>
<tr>
<td>40PP+SD</td>
<td>170</td>
<td>184</td>
<td>0.46</td>
<td>217</td>
</tr>
<tr>
<td>PP+40L</td>
<td>176</td>
<td>177</td>
<td>0.41</td>
<td>190</td>
</tr>
</tbody>
</table>

Rescue N applications 1 wk before VT were effective if recouping yield loss.
# Marshfield, 2016

The table below summarizes the findings from the Marshfield, 2016 experiment on the impact of different nitrogen application rates and timing on yield and economic return.

<table>
<thead>
<tr>
<th>Timing</th>
<th>EONR, lb/a</th>
<th>Yield, bu/a</th>
<th>NUE @EONR, △bu/lb N</th>
<th>Return to N, $/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP</td>
<td>≥210</td>
<td>≥154</td>
<td>0.37</td>
<td>200</td>
</tr>
<tr>
<td>SD</td>
<td>≥210</td>
<td>≥191</td>
<td>0.55</td>
<td>329</td>
</tr>
<tr>
<td>40PP+SD</td>
<td>≥210</td>
<td>≥189</td>
<td>0.54</td>
<td>322</td>
</tr>
<tr>
<td>PP+40L</td>
<td>≥250</td>
<td>≥168</td>
<td>0.37</td>
<td>235</td>
</tr>
</tbody>
</table>

The scatter plot on the right shows the relationship between total N application rate and yield, with different symbols representing different timing strategies: PP (pre-plant), SD (side-dress), 40PP+SD, PP+40L, and 40PP+SD+40L.
Monthly Rainfall

All sites planted in May

Red line indicates normal precipitation for the month
Conclusions

- Waiting to apply N until 1 week before VT may cause yield loss
- On well drained soils, in-season N application,
  - Do not necessarily produce more yield
  - Are not always more profitable
- On somewhat poorly drained soils,
  - PP resulted in significant yield reductions
  - SD greatest profitability
  - Rescue N application 1 week before VT can recoup yield loss
    - How much yield can be regained will vary based on weather/site conditions
Thank You!

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