Corn Production Research for Maximum Economic Yield in West-Central MN

Stevens County Corn Growers Association Annual Meeting - Morris, MN
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Minnesota Average Corn Yield

2.0 bu/A/year increase
Stevens County, MN - Avg. Corn Yield

2.3 bu/A/year increase

Year

Yield (bu/A)
Future Yield Improvement in Corn

• Corn has limited ability to take advantage of increased water & nutrients under sub-optimal plant populations.

• Future yield improvement will likely be related to greater stress tolerance.

  = Increased yield with higher plant populations
Average Corn Seed Costs for MN Growers

Data from FINBIN

Average corn seed cost ($/A)

Year


10 30 50 70 90
Yields reported by Minnesota growers in NCGA yield contest:

- 2009: 268 bu/acre (Sleepy Eye)
- 2008: 272 bu/acre (St. Cloud - Irrigated)
- Yields obtained with readily available hybrids
Components of Corn Yield

1) Kernels per acre
   – Dependent upon...
     • Plant population
     • Ear size determination prior to tasseling
     • Pollination & kernel abortion (moisture & temp.)

2) Kernel weight
   – Dependent upon...
     • Rate & duration of grain fill (moisture & temp.)
Components of Corn Yield

1) Kernels per acre
   – Dependent upon...
     • *Plant population*
     • Ear size determination prior to tasseling
     • Pollination & kernel abortion (moisture & temp.)

2) Kernel weight
   – Dependent upon...
     • Rate & duration of grain fill (moisture & temp.)
Optimum Population Varies With Yield Level

120 bu/A

240 bu/A
Hybrid Maturity x Population Study

- 2009 - following corn
- McIntosh silt loam soil
- 3 hybrids
  - DKC42-91 (92-day)
  - DKC46-60 (96-day)
  - DKC50-44 (100-day)
- 6 plant populations
Hybrid Maturity x Population Study

- Dry conditions enhanced by corn after corn

<table>
<thead>
<tr>
<th>Month</th>
<th>Rainfall (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>0.5</td>
</tr>
<tr>
<td>June</td>
<td>2.1</td>
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<tr>
<td>July</td>
<td>1.0</td>
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<tr>
<td>Aug.</td>
<td>3.8</td>
</tr>
<tr>
<td>Sept.</td>
<td>2.5</td>
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Hybrid x population: $P = 0.781$ (Not significant)
Morris, MN - 2009 (Avg. Over 3 Hybrids)

Hybrid x population: $P = 0.781$ (Not significant)

**Graph:**
- **Y-axis:** Corn grain yield (bu/A)
- **X-axis:** Final plant population (thousands/A)

- Values range from 110 to 190 bu/A.
- Population levels range from 15 to 45 thousands/A.
Seeding Rates & Risk Management

• The main benefit of reduced seeding rates is saved seed ($3.13/1,000 seeds at $250/bag).

• Too high of a population rarely reduces yield, except with very high populations or very dry conditions.

• If one plants to a predicted yield level but there are above-average conditions, yield level may increase and population may become a yield-limiting factor.
  – But... How often do such conditions occur?

• Be cautious when reducing seeding rates. Use “check” strips to ensure that low yields are not the result of a low seeding rate.
Planting Date x Population Study

- 2009 - following corn
- McIntosh silt loam
- Pioneer 38P43 (95-day RM)
- 3 planting dates:
  - Late April, mid-May, and late May
- 6 plant populations
Morris, MN - 2009

Planting date x pop: $P = 0.966$ (Not significant)

Corn grain yield (bu/A)

Final plant population (thousands/A)

- Late April
- Mid-May
Optimum Seeding Rates (seeds/acre)*
(over 2 planting dates at Morris, MN in 2009)

<table>
<thead>
<tr>
<th>Seed cost ($/bag)</th>
<th>Corn price ($/bushel)</th>
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<tbody>
<tr>
<td></td>
<td>2.75</td>
</tr>
<tr>
<td>175</td>
<td>34,800</td>
</tr>
<tr>
<td>200</td>
<td>33,700</td>
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<tr>
<td>225</td>
<td>32,500</td>
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<tr>
<td>250</td>
<td>31,400</td>
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<tr>
<td>275</td>
<td>30,200</td>
</tr>
<tr>
<td>300</td>
<td>29,000</td>
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</table>

*Seeding rates assume 5% over-planting.
Planting Date x Hybrid Study

- 2009 - following corn
- Vallers silty clay loam soil
- 35,000 seeds/acre
- 5 planting dates: April 22 to May 26 (every 7 to 10 days)
- 6 hybrids (2 of each maturity): 93-day, 96-day, and 100-day
Morris, MN: July 8, 2009

April 22
V11, 60”

May 18
V9, 52”
Morris, MN - 2009

Hybrid Maturity: $P = 0.009$ (Significant)
Planting date x Maturity: $P = 0.948$ (Not significant)

Corn grain yield (bu/A)

Planting date

- 4/20
- 4/30
- 5/10
- 5/20
- 5/30

- 93-day RM
- 98-day RM
- 100-day RM
Hybrid RM x Population Study

- 2009 – following sunflower
- 2 hybrids
  - Pioneer 39N96 (89-day)
  - Pioneer P9494XR (94-day)
- 6 seeding rates (20,500 to 45,500 seeds/acre)
- Plot size: 8 rows x 700 feet
- Yields taken with farm combine & weigh wagon

Research by Doug Holen & Jon Nelson
# Hybrid RM x Population Study

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<td>5.3</td>
</tr>
<tr>
<td>July</td>
<td>1.6</td>
</tr>
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Research by Doug Holen & Jon Nelson
Hybrid RM: $P = 0.957$ (Not Significant)
Hybrid RM x Population: $P = 0.278$ (Not Significant)

Data from Doug Holen & Jon Nelson
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Improved Alfalfa N Credit Predictions Are Needed

• Some states focus only on alfalfa stand density:
  - **Minnesota**: 150 lb N/acre for 4 or more plants/ft²
  - 100 lb N/acre for 2 or 3 plants/ft²
  - 40 lb N/acre for 1 or fewer plants/ft²

• Some states increase the N credit for regrowth:
  - **Wisconsin**: 40 lb N/acre for 8 inches or more

• No information on the effect of tillage timing

• Improved hybrids
Maximizing Yield & On-Farm Nitrogen Credits from Alfalfa to Corn

With and without fall regrowth

Fall or spring tillage
Thanks!

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