Intensive Agronomy, Intercropping, and Everything in Between to Maximize Profits with Oats

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Melfort, SK
Improved Integrated Disease Management for Oats in Saskatchewan

• To understand the effectiveness of fungicide application and generic resistance for foliar disease control in various oat varieties.

• Impact of increased plant population and their effect on reduced tillering, growth staging, and optimal fungicide timing.

• How integrated disease management strategies may vary between soil and climatic zones in Saskatchewan.
# Improved Integrated Disease Management for Oats in Saskatchewan

<table>
<thead>
<tr>
<th>Treatment #</th>
<th>Fungicide Timing (Main Plot)</th>
<th>Variety &amp; Rate (Subplot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Untreated</td>
<td>CS Camden – 300 seeds/m²</td>
</tr>
<tr>
<td>2</td>
<td>CS Camden – 300 seeds/m²</td>
<td>CS Camden – 450 seeds/m²</td>
</tr>
<tr>
<td>3</td>
<td>Summit – 300 seeds/m²</td>
<td>Summit – 300 seeds/m²</td>
</tr>
<tr>
<td>4</td>
<td>Summit – 300 seeds/m²</td>
<td>Summit – 450 seeds/m²</td>
</tr>
<tr>
<td>5</td>
<td>Flag leaf (Zadoks 39)</td>
<td>CS Camden – 300 seeds/m²</td>
</tr>
<tr>
<td>6</td>
<td>CS Camden – 300 seeds/m²</td>
<td>CS Camden – 450 seeds/m²</td>
</tr>
<tr>
<td>7</td>
<td>Summit – 300 seeds/m²</td>
<td>Summit – 450 seeds/m²</td>
</tr>
<tr>
<td>8</td>
<td>Summit – 450 seeds/m²</td>
<td>Summit – 450 seeds/m²</td>
</tr>
<tr>
<td>9</td>
<td>Heading</td>
<td>CS Camden – 300 seeds/m²</td>
</tr>
<tr>
<td>10</td>
<td>CS Camden – 300 seeds/m²</td>
<td>CS Camden – 450 seeds/m²</td>
</tr>
<tr>
<td>11</td>
<td>Summit – 300 seeds/m²</td>
<td>Summit – 450 seeds/m²</td>
</tr>
<tr>
<td>12</td>
<td>Summit – 450 seeds/m²</td>
<td>Summit – 450 seeds/m²</td>
</tr>
</tbody>
</table>
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Variety * Seeding Rate (seeds/m²)

Plant Population (plants/m²)

Camden 300
Camden 450
Summit 300
Summit 450

AB
AB
B
A

p<0.0659
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Variety * Seeding Rate (seeds/m²)

p<0.0872

Disease Severity (0-1.0)

Camden 300
Camden 450
Summit 300
Summit 450
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<table>
<thead>
<tr>
<th>Variety * Seeding Rate (seeds/m²)</th>
<th>Maturity (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camden 300</td>
<td>a</td>
</tr>
<tr>
<td>Camden 450</td>
<td>b</td>
</tr>
<tr>
<td>Summit 300</td>
<td>a</td>
</tr>
<tr>
<td>Summit 450</td>
<td>a</td>
</tr>
</tbody>
</table>

Fungicide Timing

<table>
<thead>
<tr>
<th>Fungicide Timing</th>
<th>Maturity (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>B</td>
</tr>
<tr>
<td>Flag</td>
<td>A</td>
</tr>
<tr>
<td>Heading</td>
<td>A</td>
</tr>
</tbody>
</table>

p<0.0037**

p<0.0177*
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![Graph showing yield (Bu/Ac) for different fungicide timings: Untreated, Flag, Heading.](image)

- **Untreated**
- **Flag**
- **Heading**

Fungicide Timing

Yield (Bu/Ac)

- Untreated: a
- Flag: b
- Heading: a

*p<0.0281*
Oat Varietal Response to Seeding Rate & Nitrogen Rate to Hasten Maturity without Lodging

• 2 X 2 X 4 factorial – 16 treatments
  • Variety: CS Camden, CDC Dancer
  • Seeding Rate: 250 or 450 seeds/m2
  • Nitrogen Rate/Product: 60 or 120 lb N/ac or either Urea or 50:50 split SuperU
Oat Varietal Response to Seeding Rate & Nitrogen Rate to Hasten Maturity without Lodging

![Bar chart showing plant population (plants/m²) vs. seeding rate (seeds/m²).](image)

- Plant Population (plants/m²)
- Seeding Rate (seeds/m²)

- **p<0.0001***

- **a**
- **b**

Seeding Rate (seeds/m²)

- 250
- 450
Oat Varietal Response to Seeding Rate & Nitrogen Rate to Hasten Maturity without Lodging

Plant Population (plants/m²)

Nitrogen Rate & Product

- 60 Urea
- 60 SuperU
- 120 Urea
- 120 SuperU

p<0.0102*
Oat Varietal Response to Seeding Rate & Nitrogen Rate to Hasten Maturity without Lodging

Days To Maturity

Variety

Camden

Dancer

Maturity (Scale)

Variety

Camden

Dancer

p<0.2345

p<0.0103*
Oat Varietal Response to Seeding Rate & Nitrogen Rate to Hasten Maturity without Lodging

Days to Maturity

Seeding Rate (Seeds/m²)

a, 118.2

b, 114.2

p < 0.0001*
Oat Varietal Response to Seeding Rate & Nitrogen Rate to Hasten Maturity without Lodging

![Graph showing days to maturity for different nitrogen rates and products.](image)

- 60 Urea: 112.5
- 60 SuperU: 113.9
- 120 Urea: 118.9
- 120 SuperU: 119.4

p<0.0001***
Oat Varietal Response to Seeding Rate & Nitrogen Rate to Hasten Maturity without Lodging

Nitrogen Rate & Product

60 Urea

60 SuperU

120 Urea

120 SuperU

Yield (bu/ae)

0 20 40 60 80 100 120 140 160 180 200

p<0.0001***

60 Urea

60 SuperU

120 Urea

120 SuperU

Yield (bu/ae)
Maintaining Acceptable Test weights for Milling Oats

• Demonstrate that test weights and quality for milling oats tend to worsen with delayed seeding and increased nitrogen rates
  • Test weight can vary between varieties, so seeding early and managing nitrogen is critical for low-test weight varieties.

• 2 X 2 X 3 Factorial = 12 treatments
  • Seeding date: Early May & Early June
  • Variety: CS Camden & Summit
  • Nitrogen Rate: 40, 80, 120 kg N/ha
Maintaining Acceptable Test weights for Milling Oats

Plant Population (plants/m²)

Seeding Date

May

b, 95.49

p<0.0001***

June

a, 275.25

150

100

50

0
Maintaining Acceptable Test weights for Milling Oats

<table>
<thead>
<tr>
<th>Variety</th>
<th>Plant Population (plants/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS Camden</td>
<td>212.57</td>
</tr>
<tr>
<td>Summit</td>
<td>158.16</td>
</tr>
</tbody>
</table>

p < 0.0001***
Maintaining Acceptable Test weights for Milling Oats
Maintaining Acceptable Test weights for Milling Oats

Test Weight (g/0.5 L)

<table>
<thead>
<tr>
<th>Seeding Date &amp; Variety</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>May CS Camden</td>
<td>c, 258.36</td>
</tr>
<tr>
<td>May Summit</td>
<td>b, 265.258</td>
</tr>
<tr>
<td>June CS Camden</td>
<td>a, 269.48</td>
</tr>
<tr>
<td>June Summit</td>
<td>a, 269.17</td>
</tr>
</tbody>
</table>

Date p<0.0001***
Variety p<0.0007**
Date * Variety p<0.0485*
Maintaining Acceptable Test weights for Milling Oats

Plump Seeds (%)

- c, 96.725
- b, 96.175
- a, 98.708
- a, 97.392

Seeding Date & Variety

- May CS Camden
- May Summit
- June CS Camden
- June Summit

Date p<0.0001***
Variety p<0.0001***
Date * Variety p<0.0084**
PGR Application in Oats

- Illustrate the response of oats to Manipulator application at different rates and timings and continue to build varietal response data.

<table>
<thead>
<tr>
<th>Variety</th>
<th>PGR Rate</th>
<th>PGR Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS Camden/CDC Arbourg</td>
<td>Untreated</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>1.24 L/ha</td>
<td>1-2 nodes</td>
</tr>
<tr>
<td></td>
<td>1.8 L/ha</td>
<td>1-2 nodes</td>
</tr>
<tr>
<td></td>
<td>1.24 L/ha</td>
<td>Flag Leaf</td>
</tr>
<tr>
<td></td>
<td>1.8 L/ha</td>
<td>Flag Leaf</td>
</tr>
</tbody>
</table>
PGR Application in Oats

p<0.0001***
PGR Application in Oats

Height (cm)

- Untreated: 98.438
- 1.2 L GS 31: 94.563
- 1.2 L GS 49: 94.188
- 1.8 L GS 31: 93.875
- 1.8 L GS 49: 93.25

Tests marked with different letters indicate significant differences.
PGR Application in Oats

Variety & Rate & Timing

Height (cm)

CDC Arbourg Untreat
CDC Arbourg 1.2 GS 31
CDC Arbourg 1.2 GS 49
CDC Arbourg 1.8 GS 31
CDC Arbourg 1.8 GS 49
CS Camden Untreated
CS Camden 1.2 GS 31
CS Camden 1.2 GS 49
CS Camden 1.8 GS 31
CS Camden 1.8 GS 49

p<0.0153*
PGR Application in Oats

Yield (bu/ac)

<table>
<thead>
<tr>
<th></th>
<th>CDC Arbourg</th>
<th>CS Camden</th>
</tr>
</thead>
<tbody>
<tr>
<td>a, 217.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b, 203.77</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p<0.0041*
PGR Application in Oats

Yield (bu/ac)

- Untreated: 215.91
- 1.2 L GS 31: 209.44
- 1.2 L GS 49: 209.18
- 1.8 L GS 31: 208.67
- 1.8 L GS 49: 209.24

p<0.8045
# Oat Pea Intercropping

<table>
<thead>
<tr>
<th>Combination</th>
<th>Pea Seeding Rate</th>
<th>Oat Seeding Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercrop</td>
<td>80</td>
<td>25</td>
</tr>
<tr>
<td>Intercrop</td>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>Intercrop</td>
<td>80</td>
<td>75</td>
</tr>
<tr>
<td>Intercrop</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Intercrop</td>
<td>80</td>
<td>125</td>
</tr>
<tr>
<td>Monocrop (oat)</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>Monocrop (pea-weed free)</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>Monocrop (pea-weedy check)</td>
<td>80</td>
<td>0</td>
</tr>
</tbody>
</table>
Oat Pea Intercropping

• Plant density, weed biomass, crop biomass, crop height, weed control, quality

• Lodging: had significant issues in Melfort, peas dragged down the oats, instead of the oats keeping the peas upright
  • Change in optimal density of pea rather than oats?
Oat Pea Intercropping

• Maturity: gap in maturity can be a deal breaker!
  • Over a month at Melfort, half a month at Redvers
  • Peas rotted or pods shattered in intercrop mixtures prior to oat maturity
  • Okay if doing as a silage mixture, maybe not so for grain production in high moisture environments

• Of the 6 sites, 3 went to yield.
  • Outlook: Marrowfat peas were out-competed by oats.
  • Prince Albert: deer enjoyed the tasty combination
  • Melfort: eager swather operator
  • Redvers: birds would sit on the peas and eat the oats = lower oat yields than expected
  • Yield data pending
Oat Pea Intercropping

![Graph showing the relationship between Plant Population (plants/m²) and Pea Biomass (g/m²). The graph includes linear regression lines for both Pea PPMS and Pea Biomass.]
Oat Pea Intercropping

![Graph showing the relationship between Plant Population (plants/m²) and Pea Biomass (g/m²) with trend lines for Oat PPMS and Oat Biomass. The graph includes data points for both variables and indicates a linear relationship.]