Oat Agronomy

May, W.E. ¹, and Lafond, G.P

¹ Agriculture and Agri-food Canada
Indian Head, Saskatchewan, Canada
Outline

- Cultivar
- Seeding Date
- Seeding Rate
- Row Width
- Nitrogen
- Other nutrients
- Fungicides
Cultivar

• Select cultivar acceptable to market
  – Talk to buyers about what cultivars they are buying

• Select Adapted Cultivar
  – Take advantage of improved genetics
  – Crown Rust Resistance

• Not Silver Bullet
Seeding Date

• Seed Early for consistent yield and quality
Seeding Date
Rust Resistant cultivar

- No rain
- excess moisture
- cool and wet
- dry then wet
Seeding Date

![Graph showing the relationship between planting date and test weight (g/0.5L) for different cultivars: AC Medallion, CDC Pacer, AC Juniper, and CDC Boyer. The graph includes data points for May 1, May 15, June 1, and June 15.]
Seeding Date

Test Weight (g/0.5L)

- dry then wet
- No Rain
- Cool and Wet

Planting Date

May 1  May 15  June 1  June 15
Seeding Date and Wild Oats

Grain Yield (bu/acre)

No wild oat
Wild oat

Planting Date

May 1  May 15  June 1  June 15
Seeding Rate with few wild oats

![Graph showing the relationship between Seeding Rate (Seeds/m²) and Grain Yield (bu/acre).]
Seeding Rate with few wild oats

![Graph showing the relationship between seeding rate and grain yield. The x-axis represents seeding rate (Seeds/m²) ranging from 150 to 450, and the y-axis represents grain yield (bu/acre) ranging from 70 to 115. There is a general trend of increasing grain yield with increasing seeding rate.](image-url)
Seeding Rate with few wild oats

Test Weight (g/0.5 L) vs. Seeding Rate (Seeds/m²)
Seeding Rate and Wild oats

- Seeding Rate has a small impact on yield and quality
- Importance of this impact increases in the presence of wild oat
Seeding Rate and Wild Oats

Seeding Rate (Seeds/m²)

Grain Yield (bu/acre)

- low (10 WO/m²)
- high (27 WO/ m²)

150 (14)
250 (23)
350 (32)
450 (42)
Grain Yield, Seeding Rate and Wild Oats
Seeding Rate and Wild Oats

Wild Oat Biomass (lb/acre)

- low (10 WO/m²)
- high (27 WO/m²)

Seeding Rate (Seeds/m²)

150 (14)
250 (23)
350 (32)
450 (42)
Wild Oat Biomass and Tame Oat Seeding Rate
Seeding Rate and Wild Oats

![Graph showing the relationship between seeding rate and test weight for different dates (Early-May, Mid-May, Early-June, Mid-June) at different test weights (150, 250, 350, 450 g/0.5L).]
Seeding Rate and Wild Oats

Wild oats in harvested sample (%)

<table>
<thead>
<tr>
<th>Planting Date</th>
<th>Sample (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early May*</td>
<td>1.0</td>
</tr>
<tr>
<td>Mid May*</td>
<td>0.8</td>
</tr>
<tr>
<td>Early June</td>
<td>0.6</td>
</tr>
<tr>
<td>Mid June</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Seeding Rates:
- 150
- 250
- 350
- 450
150 m²
(13 ft²)

350 m²
(32 ft²)
### Seeding rate and bu/acre

300 plants/m$^{-2}$ (28 plants/ft$^{-2}$)

<table>
<thead>
<tr>
<th>9-10 seed lots</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>2.9</td>
<td>3.6</td>
</tr>
<tr>
<td>1999</td>
<td>2.7</td>
<td>4.3</td>
</tr>
<tr>
<td>2000</td>
<td>2.8</td>
<td>4.1</td>
</tr>
</tbody>
</table>
Seeding Rate and Wild oats

• Selling Oat Seed
  – Helps sell your client buy the right amount of oats
  – This is a service to your clients!

• Many growers want to use high seeding rate order the seed then do the TKWT and realize they have to use a lower rate or go back and get more seed.
Row Width and Grain Yield (bus/ acre)

Grain Yield

Row Width (inches)

80 kg N/ha (171 lbs N/acre)
Row Width and Test weight (g/ 0.5 L)
Fertility

Nitrogen

• 54 lb/acre of applied N is enough
  – higher levels tend to decrease test weight without increasing yield
  – Red River valley can be an exception
N rate and Grain Yield

Grain Yield vs. N Rate (kg N / ha)

- N Rate (kg N / ha)
  - 15
  - 30
  - 60
  - 90
  - 120

- Grain Yield
  - 30
  - 60
  - 90
  - 120
N rate and Test weight (g/ 0.5 L)
Fertility

![Graph showing the relationship between nitrogen rate and grain yield for AC Assinaboia and CDC Pacer.]
Grain Yield (bus/acre)

Optimum N Rate @ 60 kg N/ha

Grain Yield

N Rate (kg N/ha)

80 kg N/ha (71 lbs N/acre)

16"

2009

2010

2011
Test weight (g/ 0.5 L)

~Optimum N Rate @ 60 kg N/ha
Fertility
Oat-Flax-Wheat

Grain Yield (bu/acre)

N Rate (soil + fertilizer kg/ha)
Oat Test Weight

Test weight (g /0.5L) vs Nitrogen (kg/ha)

- L-T ZT
- S-T Zt
- Poly. (S-T Zt)
- Linear (L-T ZT)
Phosphorous

- Can promote early season growth
  - Increased early season biomass 6 out of 6 years
  - Increased yield 2 out of 6 years
    - Mohr et al., 2004
- Will phosphorous make oats more competitive?
Phosphate and Yield

*Significant linear response
Phosphorous

- Phosphorous did not make the oats more competitive with wild oats over three site years.
- Small increase when soils low in phosphorous
- No consistent effect on quality
Fertility

**Potassium**
- No large effect on yield or quality when not recommended by soil test

**Sulfur**
- No large effect on yield or quality when not recommended by soil test
Seeding Date

![Bar chart showing grain yield for Mid May and Early June]

- **Mid May**: 123
- **Early June**: 110

*Sig*
Sites with Low Crown Rust
Mid May

Grain Yield (bu/acre)

<table>
<thead>
<tr>
<th>Variety</th>
<th>Fungicide</th>
<th>No Fungicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Morgan</td>
<td>148</td>
<td>148</td>
</tr>
<tr>
<td>CDC Boyer</td>
<td>138</td>
<td>129</td>
</tr>
<tr>
<td>CDC Orrin</td>
<td>142</td>
<td>141</td>
</tr>
<tr>
<td>Leggett</td>
<td>133</td>
<td>132</td>
</tr>
</tbody>
</table>
Sites with Low Crown Rust

June

Grain Yield (bu/acre)

<table>
<thead>
<tr>
<th></th>
<th>Fungicide</th>
<th>No Fungicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Morgan</td>
<td>150</td>
<td>137</td>
</tr>
<tr>
<td>CDC Boyer</td>
<td>131</td>
<td>119</td>
</tr>
<tr>
<td>CDC Orrin</td>
<td>140</td>
<td>134</td>
</tr>
<tr>
<td>Legget</td>
<td>127</td>
<td>122</td>
</tr>
</tbody>
</table>

Fungicide
No Fungicide
× Sig
Sites with High Crown Rust
Mid May

Grain Yield (bu/acre)

- **AC Morgan**
  - Fungicide: 121
  - No Fungicide: 104

- **CDC Boyer**
  - Fungicide: 103
  - No Fungicide: 96

- **CDC Orrin**
  - Fungicide: 112
  - No Fungicide: 106

- **Leggett**
  - Fungicide: 108
  - No Fungicide: 106

Fungicide
No Fungicide
* Sig
Sites with High Crown Rust
June

<table>
<thead>
<tr>
<th>Sites</th>
<th>Grain Yield (bu/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Morgan</td>
<td>97</td>
</tr>
<tr>
<td>CDC Boyer</td>
<td>89</td>
</tr>
<tr>
<td>CDC Orrin</td>
<td>92</td>
</tr>
<tr>
<td>Legget</td>
<td>93</td>
</tr>
</tbody>
</table>

- **Fungicide**
- **No Fungicide**
- ✗ Sig
Seeding Date

Test Weight (g/0.5L)

- Mid May: 249
- Early June: 236

Legend:
- test wt
- Sig
Cultivar

Test Weight (g/0.5L)

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>No Fungicide</th>
<th>Fungicide</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Morgan</td>
<td>230</td>
<td>242</td>
<td></td>
</tr>
<tr>
<td>CDC Boyer</td>
<td>232</td>
<td>238</td>
<td>✗</td>
</tr>
<tr>
<td>CDC Orrin</td>
<td>240</td>
<td>246</td>
<td>✗</td>
</tr>
<tr>
<td>Leggett</td>
<td>248</td>
<td>248</td>
<td></td>
</tr>
</tbody>
</table>
Sites with Low Crown Rust
Mid May

<table>
<thead>
<tr>
<th>Products</th>
<th>Test Weight (g/0.5L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Morgan</td>
<td>248 248</td>
</tr>
<tr>
<td>CDC Boyer</td>
<td>240 239</td>
</tr>
<tr>
<td>CDC Orrin</td>
<td>253 251</td>
</tr>
<tr>
<td>Legget</td>
<td>250 251</td>
</tr>
</tbody>
</table>

- **Fungicide**
- **No Fungicide**

*Sig*
Sites with Low Crown Rust
Early June

<table>
<thead>
<tr>
<th>Test Weight (g/0.5L)</th>
<th>AC Morgan</th>
<th>CDC Boyer</th>
<th>CDC Orrin</th>
<th>Legget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fungicide</td>
<td>246</td>
<td>236</td>
<td>249</td>
<td>244</td>
</tr>
<tr>
<td>No Fungicide</td>
<td>245</td>
<td>232</td>
<td>246</td>
<td>244</td>
</tr>
</tbody>
</table>

Legend:
- **Fungicide**
- **No Fungicide**
- **Sig**
Sites with High Crown Rust
Mid May

<table>
<thead>
<tr>
<th>Test Weight (g/0.5L)</th>
<th>Fungicide</th>
<th>No Fungicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Morgan</td>
<td>255</td>
<td>242</td>
</tr>
<tr>
<td>CDC Boyer</td>
<td>247</td>
<td>243</td>
</tr>
<tr>
<td>CDC Orrin</td>
<td>257</td>
<td>251</td>
</tr>
<tr>
<td>Leggett</td>
<td>258</td>
<td>256</td>
</tr>
</tbody>
</table>

*Sig
Sites with High Crown Rust
Early June

<table>
<thead>
<tr>
<th>Test Weight (g/0.5L)</th>
<th>Fungicide</th>
<th>No Fungicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Morgan</td>
<td>229</td>
<td>203</td>
</tr>
<tr>
<td>CDC Boyer</td>
<td>233</td>
<td>224</td>
</tr>
<tr>
<td>CDC Orrin</td>
<td>236</td>
<td>225</td>
</tr>
<tr>
<td>Leggett</td>
<td>247</td>
<td>247</td>
</tr>
</tbody>
</table>

* Sig
Conclusions

**Seeding Date**

Large effect on yield and test weight

-13 bu/acre

-13 g/0.5L
Conclusions

Low Crown Rust Sites

• CDC Boyer – A Fungicide increased grain yield in May and June AC
• Morgan – A Fungicide increased grain yield in June
• Test weight was not changed by the application of a fungicide
Conclusions

High Crown Rust Sites

• **Leggett** – Grain yield and test weight not affected by a fungicide

• **AC Morgan** - Grain yield and test weight increased when a fungicide was applied at both seeding dates

• **CDC Orrin and CDC Boyer** - Grain yield and test weight increased when a fungicide was applied to the early June seeded oats
Nitrogen x Fungicide at Indian Head Triactor

Grain Yield (bu/acre)

N Rate (lb N / acre)

- No Fungicide
- Headline
- Stratego
Nitrogen x Fungicide at Melfort
Triactor

Grain Yield (bu/acre) vs. N Rate (lb N / acre)

- No Fungicide
- Headline
- Stratego
Nitrogen x Fungicide at Melfort
Triactor

Test weight (g/0.5 L)

N Rate (lb N / acre)

- No Fungicide
- Headline
- Stratego