Effect of Fungicide & Cultivar on Cereal Yield & Quality

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Outline

• Introduction
• Methodology
• Preliminary Results
  ▪ Wheat
  ▪ Oats
• Preliminary Conclusions
• Acknowledgments
• Questions
Introduction

- Disease can significantly decrease cereal yields and quality impacting the profitability of farmers in Manitoba.
- Fungicides work!
- Genetics work!
- However, there is very little current information available to farmers looking at the interaction of fungicides & genetics
Introduction....continued

• MCVET initiated a three-year study with 2 Objectives:
  1. To initiate disease evaluation for wheat & oat varieties over a period of 3 years and 5 locations in MB.
    • Evaluated by AAFC pathologists
      ▪ Wheat – leaf, stem & stripe rust
      ▪ Oats – crown (leaf) & stem rust
Introduction….continued

2. To determine the effect of disease and fungicide application on yield & quality parameters over a period of 3 years & 5 locations in MB.

- Yield
- Quality - test weight, protein, fusarium damaged kernels (FDK%), midge, ergot, and graded
Methodology

• 3 years – 2008, 2009 & 2010
• 5 locations per year
  • Melita, Portage, Rosebank, St. Adolphe & Stonewall
• 2 trials side by side, both in RCB design
  • Sprayed & unsprayed
• Sprayed trial received a split application of Tilt 250E (propiconazole)
  • Timing – first application when earliest entry is at the target stage with second application following 7-10 days later
Methodology: 28 - 29 Wheat Varieties

**CWRS**
- 5602HR (R)
- Fieldstar VB (R)
- 5603HR (R)
- Glenn (R)
- WR859 CL (R)
- KANE (R)
- McKenzie (R)
- Unity VB (R)
- Lillian (R)

**CDC Teal (MR)**
- Goodeve VB (MR)
- Harvest (MR)
- Infinity (MR)

**AC Domain (I)**
- Alvena (I)
- Waskada (I)
- CDC Go (I) – 2010 only

**Stettler (MS)**
- CDC Abound (MS)
- AC Barrie (MS)

**Superb (S)**
Methodology: 28 - 29 Wheat Varieties

- **CPS Red**
  - 5702PR (MR)
- **CWES**
  - Burnside (R)
  - Glencross VB (MR)
  - CDN Bison (MR)
- **CWHWS**
  - Snowbird (I)
  - Snowstar (MR)
- **CWSWS**
  - AC Andrew (S)
- **Other**
  - Hoffman (MR)
Methodology: 14 - 15 Oat Varieties

- Leggett (R)
- Summit (R)
- Souris (R)
- HiFi (R)
- Stainless (R) (2009 & 2010)
- Triactor (MR)
- Jordan (I)
- CDC Dancer (MS)
- CDC Minstrel (MS)
- CDC ProFi (S) (not tested in 2010)
- Ronald (S)
- AC Morgan (S)
- Triple Crown (S)
- AC Assiniboia (S)
- Furlong (S)
Preliminary Results

• Results presented today are only preliminary findings of **Objective 2** of the study:
  • To determine the effect of disease and fungicide application on yield and quality parameters.

- Data analysis, grading is ongoing
- Final report will be available in the coming months
# 2008 Wheat Yields

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>Yield (bu/ac)</th>
<th>Unsprayed</th>
<th>Sprayed</th>
<th>+ / -</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Portage</td>
<td></td>
<td>73</td>
<td>54</td>
<td>- 19</td>
</tr>
<tr>
<td></td>
<td>Rosebank</td>
<td></td>
<td>87</td>
<td>89</td>
<td>+ 2</td>
</tr>
<tr>
<td></td>
<td>Stonewall</td>
<td></td>
<td>42</td>
<td>51</td>
<td>+ 9</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td></td>
<td>67</td>
<td>65</td>
<td>- 2</td>
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</tbody>
</table>
2008 Wheat Yields

Variety

Yield (bu/ac)

Unsprayed
Sprayed
## 2009 Wheat Yields

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>Unsprayed</th>
<th>Sprayed</th>
<th>+ / -</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>Melita</td>
<td>73</td>
<td>79</td>
<td>+ 6</td>
</tr>
<tr>
<td></td>
<td>Rosebank</td>
<td>91</td>
<td>83</td>
<td>- 8</td>
</tr>
<tr>
<td></td>
<td>Portage</td>
<td>57</td>
<td>61</td>
<td>+ 4</td>
</tr>
<tr>
<td></td>
<td>St. Adolphe</td>
<td>54</td>
<td>54</td>
<td>=</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>69</strong></td>
<td><strong>69</strong></td>
<td>=</td>
</tr>
</tbody>
</table>
Yield Difference: Sprayed - Unsprayed

Variety

Difference (bu/ac)

CDN Bison
5603HR
Burnside
AC Domain
CDC Teal
Lillian
Snowbird
Alvena
Stettler
CDC Abound
Glencross VB
Snowstar
AC Barrie
5602HR
AC Andrew
Goodeve VB
5702PR
Waskada
Hoffman
Glenn
Harvest
WR859 CL
Infinity
KANE
Superb
Fieldstar VB
Unity VB
McKenzie
## 2010 Wheat Yields

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>Yield (bu/ac)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Unsprayed</td>
<td>Sprayed</td>
<td>+ / -</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>Melita</td>
<td>53</td>
<td>77</td>
<td>+ 24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rosebank</td>
<td>64</td>
<td>73</td>
<td>+ 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>St.Adolphe</td>
<td>42</td>
<td>47</td>
<td>+ 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>53</td>
<td>66</td>
<td>+ 13</td>
<td></td>
</tr>
</tbody>
</table>
2010 Wheat Yields

Yield (bu/ac)

Variety

Unsprayed
Sprayed
Summary of Wheat Quality

• In 2008 & 2009, there was little to no rust
• Rust was more prevalent in 2010
• All years - high pressure & levels of FHB in some areas
  ▪ In majority of trials, FDK was the main downgrading factor
  ▪ Other downgrading factors did include ergot, mildew, and midge
## 2008 Oat Yields

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>Unsprayed</th>
<th>Sprayed</th>
<th>+ / -</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Melita</td>
<td>151</td>
<td>163</td>
<td>+ 12</td>
</tr>
<tr>
<td></td>
<td>St. Adolphe</td>
<td>182</td>
<td>185</td>
<td>+ 3</td>
</tr>
<tr>
<td></td>
<td>Stonewall</td>
<td>139</td>
<td>145</td>
<td>+ 4</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>157</strong></td>
<td><strong>164</strong></td>
<td><strong>+ 7</strong></td>
</tr>
</tbody>
</table>

Yield (bu/ac)
Yield Difference: Sprayed - Unsprayed

Variety

Triple Crown
HiFi
Ronald
Legget
Triactor
Furlong
Souris
AC
Assiniboia
AC Morgan
Summit
CDC Dancer
Jordan
CDC Minstrel
CDC Pro-Fi

Comparison of yield difference between sprayed and unsprayed conditions for different varieties. The graph shows an increasing trend in yield difference as one moves from left to right along the variety axis.
### 2008 Crop Year - Oat Quality

<table>
<thead>
<tr>
<th>Variety</th>
<th>Test Weight (g/0.5L)</th>
<th>Grade Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unsprayed</td>
<td>Sprayed</td>
</tr>
<tr>
<td>CDC ProFi</td>
<td>223</td>
<td>230</td>
</tr>
<tr>
<td>Souris</td>
<td>234</td>
<td>241</td>
</tr>
<tr>
<td>Triactor</td>
<td>220</td>
<td>227</td>
</tr>
<tr>
<td>Furlong</td>
<td>234</td>
<td>240</td>
</tr>
<tr>
<td>CDC Minstrel</td>
<td>228</td>
<td>233</td>
</tr>
<tr>
<td>Jordan</td>
<td>221</td>
<td>226</td>
</tr>
<tr>
<td>AC Assiniboia</td>
<td>229</td>
<td>233</td>
</tr>
<tr>
<td>CDC Dancer</td>
<td>239</td>
<td>243</td>
</tr>
<tr>
<td>Ronald</td>
<td>241</td>
<td>244</td>
</tr>
<tr>
<td>Triple Crown</td>
<td>230</td>
<td>232</td>
</tr>
<tr>
<td>AC Morgan</td>
<td>235</td>
<td>236</td>
</tr>
<tr>
<td>Leggett</td>
<td>241</td>
<td>239</td>
</tr>
<tr>
<td>Summit</td>
<td>242</td>
<td>240</td>
</tr>
<tr>
<td>HiFi</td>
<td>241</td>
<td>233</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>233</td>
<td>236</td>
</tr>
</tbody>
</table>
# 2009 Oat Yields

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>Yield (bu/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Unsprayed</td>
</tr>
<tr>
<td>2009</td>
<td>Melita</td>
<td>163</td>
</tr>
<tr>
<td></td>
<td>Rosebank</td>
<td>161</td>
</tr>
<tr>
<td></td>
<td>St. Adolphe</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Stonewall</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>147</strong></td>
</tr>
</tbody>
</table>
2009 Oat Yields

Yield (bu/ac) - Unsprayed vs. Sprayed

Variety:
- Furlong
- Leggett
- AC Morgan
- Triple Crown
- AC Assiniboia
- CDC Dancer
- CDC Minstrel
- CDC Pro-Fi
- HiFi
- Jordan
- Ronald
- Summit
- Souris
- Triactor
- Stainless

Manitoba Agriculture, Food and Rural Initiatives
Yield Difference: Sprayed - Unsprayed

Variety

Difference (bu/ac)
## 2009 Crop Year - Oat Quality

<table>
<thead>
<tr>
<th>Variety</th>
<th>Unsprayed</th>
<th>Sprayed</th>
<th>+ / -</th>
<th>+ / -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ronald</td>
<td>228</td>
<td>239</td>
<td>11</td>
<td>+</td>
</tr>
<tr>
<td>AC Assiniboia</td>
<td>231</td>
<td>238</td>
<td>7</td>
<td>+</td>
</tr>
<tr>
<td>Summit</td>
<td>232</td>
<td>238</td>
<td>6</td>
<td>+</td>
</tr>
<tr>
<td>Souris</td>
<td>233</td>
<td>239</td>
<td>6</td>
<td>+</td>
</tr>
<tr>
<td>Leggett</td>
<td>231</td>
<td>236</td>
<td>5</td>
<td>+</td>
</tr>
<tr>
<td>Stainless</td>
<td>228</td>
<td>230</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Jordan</td>
<td>216</td>
<td>218</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CDC Minstrel</td>
<td>232</td>
<td>234</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Triple Crown</td>
<td>235</td>
<td>236</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Triactor</td>
<td>225</td>
<td>226</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CDC Dancer</td>
<td>238</td>
<td>239</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HiFi</td>
<td>241</td>
<td>238</td>
<td>-3</td>
<td></td>
</tr>
<tr>
<td>CDC ProFi</td>
<td>226</td>
<td>222</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>AC Morgan</td>
<td>236</td>
<td>231</td>
<td>-5</td>
<td>-</td>
</tr>
<tr>
<td>Furlong</td>
<td>235</td>
<td>227</td>
<td>-8</td>
<td>-</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>231</strong></td>
<td><strong>233</strong></td>
<td><strong>2</strong></td>
<td></td>
</tr>
</tbody>
</table>
# 2010 Oat Yields

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>Unsprayed</th>
<th>Sprayed</th>
<th>+ / -</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Melita</td>
<td>128</td>
<td>182</td>
<td>+ 54</td>
</tr>
<tr>
<td></td>
<td>St. Adolphe</td>
<td>124</td>
<td>141</td>
<td>+ 17</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>126</strong></td>
<td><strong>162</strong></td>
<td><strong>+ 36</strong></td>
</tr>
</tbody>
</table>
2010 Oat Yields

Yield (bu/ac)

Variety

Unsprayed
Sprayed
Yield Difference: Sprayed - Unsprayed

Variety

Triple Crown, Stainless, Legget, AC Morgan, CDC Dancer, CDC Minstrel, AC, Assiniboia, HHi, Sours, Triactor, Furlong, Summit, CDC Pro-Fi, Ronald, Jordan

Difference (bu/ac)

-10 -5 0 5 10 15 20 25
## 2010 Crop Year - Oat Quality

<table>
<thead>
<tr>
<th>Variety</th>
<th>Unsprayed</th>
<th>Sprayed</th>
<th>+ / -</th>
<th>+ / -</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Morgan</td>
<td>183</td>
<td>227</td>
<td>44</td>
<td>+</td>
</tr>
<tr>
<td>Ronald</td>
<td>190</td>
<td>224</td>
<td>34</td>
<td>+</td>
</tr>
<tr>
<td>Jordan</td>
<td>167</td>
<td>197</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>CDC Minstrel</td>
<td>194</td>
<td>220</td>
<td>26</td>
<td>+</td>
</tr>
<tr>
<td>Summit</td>
<td>212</td>
<td>235</td>
<td>23</td>
<td>+</td>
</tr>
<tr>
<td>Triple Crown</td>
<td>207</td>
<td>226</td>
<td>19</td>
<td>+</td>
</tr>
<tr>
<td>AC Assiniboia</td>
<td>206</td>
<td>213</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>CDC Dancer</td>
<td>230</td>
<td>237</td>
<td>7</td>
<td>+</td>
</tr>
<tr>
<td>Triactor</td>
<td>210</td>
<td>217</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Leggett</td>
<td>227</td>
<td>231</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Stainless</td>
<td>224</td>
<td>225</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HiFi</td>
<td>235</td>
<td>234</td>
<td>-1</td>
<td>-</td>
</tr>
<tr>
<td>Souris</td>
<td>236</td>
<td>229</td>
<td>-7</td>
<td>-</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>209</strong></td>
<td><strong>224</strong></td>
<td><strong>15</strong></td>
<td><strong>+</strong></td>
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</tbody>
</table>
### Preliminary Conclusions/Trends

- **Yield Response**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Year</th>
<th>Yield (bu/ac)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Unsprayed</td>
<td>Sprayed</td>
<td>+ / -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>2008</td>
<td>67</td>
<td>65</td>
<td>- 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>69</td>
<td>69</td>
<td>=</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>53</td>
<td>66</td>
<td>+ 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oat</td>
<td>2008</td>
<td>157</td>
<td>164</td>
<td>+ 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>147</td>
<td>153</td>
<td>+ 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>126</td>
<td>162</td>
<td>+ 36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Preliminary Conclusions/Trends

• Yield – Wheat & Oats
  - Under higher levels of disease pressure, trend towards lower yield response to fungicide application on varieties with improved disease resistance
  - More analysis required to determine:
    - if there is an interaction between genetics & fungicides on yield & quality
    - the effect of genetics, fungicide use and their interaction on other agronomic factors – height, lodging, maturity.
Preliminary Conclusions/Trends

• Quality
  ▪ In wheat, main downgrading factor was FDK.
  ▪ In oat, main downgrading factor was light test weight.
    • Variable response of test weight to fungicide application
  ▪ More analysis required to determine:
    – the effect of both variety & fungicide on quality & grades in both crops
    – the effect of variety on FDK
Acknowledgements

• MCVET
• Dr. Brent McCallum & Dr. Tom Fetch
  ▪ Pathologists at AAFC – Cereal Research Centre
• Trial Cooperators
  ▪ WADO, CMCDC, Viterra/Syngenta Seeds, JRI Kelburn Farms, SICTC
• Agri-Food Research & Development Initiative (ARDI)
Questions?

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