Stripe Rust In Western Canada

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Outlines

- What is stripe rust & how to recognize it
- Why it is so damaging
- World wide situation and in Canada
- How to manage it
- Questions
Stripe (yellow) rust of wheat
*Puccinia striiformis f.sp tritici* (Pst)

Pst can infect the host at any growth stage from seedling to maturity
Stripe rust is explosive in nature

- Millions of spores travel long distances at high altitude
- Infection on the plant can spread very fast
- Can infect the plant at any growth stage
- No much physical damage needed to destroy the plant
- Change in virulence is very rapid
Origin and migration routes of Pst

Ali et al., 2014
Global status of stipe rust (2000-2010)

<table>
<thead>
<tr>
<th>Code</th>
<th>Incidence</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Rare</td>
<td>negligible losses</td>
</tr>
<tr>
<td>Orange</td>
<td>Localised, 2 in 5 years over 25% growing areas</td>
<td>1-5% crop losses</td>
</tr>
<tr>
<td>Red</td>
<td>Widespread 2 or 3 years in 5 over whole production region</td>
<td>5-10% crop losses</td>
</tr>
</tbody>
</table>

*Wellings, Euphytica. 2011*
Alberta is a hot spot for the pathogen

- close to PNW
- mild winter, cool wet spring & summer
- green bridge

Conditions for infection

Cool wet weather
- Spores require at least 3h continuous moisture on plant surface
- Old isolates germinates at 8-12 °C, new at 18 °C
- Survive dormant mycelia in infected leaves

Wind: reduce on site spore germination, but increase spore viability and spreading
The disease this year in Southern AB

<table>
<thead>
<tr>
<th>Infection</th>
<th>Incidence</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trace</td>
<td>1-2</td>
<td>1-3</td>
</tr>
<tr>
<td>Light</td>
<td>&gt;2-5</td>
<td>&gt;2-5</td>
</tr>
<tr>
<td>Moderate</td>
<td>6-15</td>
<td>6-19</td>
</tr>
<tr>
<td>Severe</td>
<td>≥15</td>
<td>≥20</td>
</tr>
</tbody>
</table>
Stripe rust incidence & severity in 2016

6 fields with severe infection
10 moderate
5 (light and trace)
33 clean
YR genes in differential vs in wheat cultivars in Western Canada

YR in differentials

YrA, Yr1, Yr2
Yr4, Yr5, Yr6, Yr7
Yr8, Yr9, Yr10, Yr15
Yr17, Yr24, Yr26, Yrsp,
Yr32, Yr28, Yr29, Yr31,
Yr18, Yr 30, Yr36, Yr2
etc...

In Western Canadian lines:

WW: Yr10, Yr17
CWRS: Yr18, Yr36, Yr50?
<table>
<thead>
<tr>
<th>Resistance rating</th>
<th>Definition</th>
<th>Potential yield loss from stripe rust (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very susceptible (VS)</td>
<td>Early high disease build-up; can promote epidemic development</td>
<td>80</td>
</tr>
<tr>
<td>Susceptible (S)</td>
<td>High disease build-up</td>
<td>60</td>
</tr>
<tr>
<td>Moderately susceptible (MS)</td>
<td>Develops disease less quickly and so reduces loss risk</td>
<td>40</td>
</tr>
<tr>
<td>Moderately resistant to moderately susceptible (MRMS)</td>
<td>Some partial resistance; losses depend on disease pressure</td>
<td>30</td>
</tr>
<tr>
<td>Moderately resistant (MR)</td>
<td>High partial resistance; generally few losses</td>
<td>0</td>
</tr>
</tbody>
</table>
Management Practices

- Avoid early planting of winter wheat
- Reduce volunteer plants and grasses
- Avoid excessive irrigation
- Avoid excessive fertilization
- Appropriate use of fungicides
Challenges

- The pathogen ability to change its virulence
- 20 differential lines can classify 1 million races ($2^n = \text{no of races}$)
- Some of the res-genes are temperature or light dependent
- Res or Sus is not black and white
- Huge area is dominated by few Yr-genes
  selection pressure to defeat resistance
- Climate change
Thank You!

National Wheat Improvement Cluster

Alberta Crop Industry Development Fund