Diseases and Insects
2014
Crop Opportunity & Scott Research Update
North Battleford
March 6, 2014
Sherrilyn Phelps, P.Ag.
Saskatchewan Ministry of Agriculture
The Disease Triangle

Pathogen

Environment

Host
Annual Canola Disease Survey

- Fields volunteered by growers or selected randomly.
- 100 plants per field
  - severity assessed for some diseases
- 268 canola crops surveyed in 2013
- Report will be submitted to the Canadian Plant Disease Survey:
  - http://www.cps-scp.ca/cpds.shtml
- Thanks to everyone who helps out with this survey each year!
60% of crops surveyed had at least a trace of sclerotinia (91% in 2012).
Trending Sclerotinia Incidence in Saskatchewan (1999-2013)
Sclerotinia Check-List

- Developed in Sweden, adapted by Canola Council of Canada
  - [ww.canolacouncil.org](http://www.canolacouncil.org)
- Apply checklist shortly after first flower
  - when 75% of the canola plants have at least 3 open flowers
- Fields scoring >40 will likely benefit from a fungicide
  - Depends on fungicide cost and commodity price.
- Optimum spray window is between 20-30% flowering
Apothecia Development

• Part of checklist
• New project – correlate weather patterns with apothecia development to develop predictive model for producers

Canola Science Cluster Project: 2014-2017
Evaluation of sclerotia depots in canola fields to support sclerotinia risk assessment.
Dr. Lone Buchwaldt, Agriculture & Agri-Food Canada
Blackleg

- Blackleg (stem lesions and/or basal cankers) was observed in 31% of canola crops surveyed.
- Overall low severity.

Keep an eye on it!
Fungicide (blackleg timing) on canola yield (kg/ha)

Kutcher, et al.  Mean of 9 site-years of data 1999-2003, Melfort and Scott, SK
Clubroot

Visual Symptoms
- Wilting, stunting, yellowing, premature ripening
- Root Galls

DNA Testing
- Soil or plant roots - PCR test

Clubroot Confirmation
- Need symptoms in a plant and + DNA
Key Clubroot Messages:

• Prevention
  • Know risks of introduction
  • Base sanitation on risk – remove obvious soil
  • Monitor access to fields
• Identify clubroot early
• Develop a clubroot management plan
• Work with your municipality
Cereal Diseases: 2014

- Seed Quality – not as much an issue
- Concern for:
  - Leaf Spot Complex
  - Rusts
  - Fusarium Head Blight
  - Ergot
Fusarium

- Many species involved
- Timing of infection determines disease:
  - Infect seedlings/crown = seedling blight, root rots, crown rot, etc
  - Infect head = FHB
- Pathogen present in soil, crop residue and can be introduced on seed
- Seedling infections do not cause FHB but are a source of infected residue for next year
Fusarium Head Blight

• Affects kernels in cereal heads
  ▪ wheat, barley, oats, rye, corn, canary seed, forage grasses, triticale

• Caused by complex of *Fusarium* species
  ▪ Critical one = *F. graminearum*
    ▪ Greatest yield reductions
    ▪ Toxin in grain
FHB infection process in wheat

- **Inoculum Increase**: 4-7 days prior = spore production.
- **Emergence**: 3-6 days = begin flowering
- **Infection**: 7-14 days = colonizes head and mycotoxin produced. New infections.
- **Symptoms**:
Pea Diseases

- Mycosphaerella Blight / Ascochyta Blight
Foot rot (Ascochyta)
Root rot (Fusarium, Rhizoctonia, Pythium or Aphanomyces)
- Severe epidemics under cool, wet conditions
- 30 to 50% yield losses have been reported
- Some can infect at any stage
Phanatomyces Root Rot

Research initiated by
Banniza, Cheryl
Crop Development
re, U of S

Root samples
(July, pea,
lentil, vetch
and clover)

Soil samples
for growth
chamber study

Contribution of Cheryl Cho, Crop
Development Centre
Assiniboia soil: Normal watering
Sterilized soil vs Unsterilized soil

Presence of *Aphanomyces* could be
observed visually from EVERY region
and (lentil and pea).

Confirmation of the pathogen was confirmed
by PCR (for 7 of 11 sites).

Courtesy of Cheryl Cho, Crop
Protection Centre

S. Boechler
Assiniboia soil (waterlogged) sterile (no disease) vs Non-sterile
How Important is Aphanomyces?

 Likely present throughout the province. 

Treated treatments are not affective against root rots. 

Disease severity is higher under wet conditions. 

Resistance: 
Cereals and oilseeds are not hosts. 
Tolerance is available in chickpea and faba bean. 
Breeding R for other legumes is possible. 
Resistance exists in alfalfa varieties already. 
Existing capability should be available soon?
Disease Decisions for 2014

- Hosts
  - Rotation
  - Variety
A. Rotations

Less effective if:
- Wind-borne spores - Ascochyta, FHB
- Wide host range - Sclerotinia

More effective if:
- High infection from stubble – cereal leaf diseases, blackleg
- Specific to certain crops - blackleg
B. Variety Choice

Cereals – leaf diseases, rust, smut, *Fusarium* (?)  
Canola – sclerotinia, clubroot, blackleg  
Pulses – ascochyta/mycosphaerella, PM  
Lodging, height, maturity
### Varieties of Grain Crops

#### Wheat

**Yield Test Category (% CDC Duco)**

<table>
<thead>
<tr>
<th>Site-Years Tested</th>
<th>Low Moisture Potential</th>
<th>High Moisture Potential</th>
<th>Winter Survival</th>
<th>Maturity Class</th>
<th>Protein Content (%)</th>
<th>Plant Height (cm)</th>
<th>Resistance to Lodging</th>
<th>Stem Rust</th>
<th>Leaf Rust</th>
<th>Stripe Rust</th>
<th>T industre</th>
<th>T yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Western Red Winter</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>101</td>
<td>99</td>
<td>G</td>
<td>M</td>
<td>15</td>
<td>90</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>VP</td>
<td>VP</td>
<td>VP</td>
</tr>
<tr>
<td>200</td>
<td>100</td>
<td>95</td>
<td>F</td>
<td>L</td>
<td>10</td>
<td>10</td>
<td>G</td>
<td>VP</td>
<td>VP</td>
<td>VP</td>
<td>F</td>
<td>VP</td>
</tr>
<tr>
<td>210</td>
<td>100</td>
<td>92</td>
<td>F</td>
<td>L</td>
<td>15</td>
<td>10</td>
<td>G</td>
<td>VP</td>
<td>VP</td>
<td>VP</td>
<td>F</td>
<td>VP</td>
</tr>
<tr>
<td><strong>Western General Purpose</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>110</td>
<td>105</td>
<td>G</td>
<td>M</td>
<td>15</td>
<td>90</td>
<td>G</td>
<td>VP</td>
<td>VP</td>
<td>VP</td>
<td>F</td>
<td>VP</td>
</tr>
<tr>
<td>200</td>
<td>110</td>
<td>105</td>
<td>F</td>
<td>L</td>
<td>10</td>
<td>10</td>
<td>G</td>
<td>VP</td>
<td>VP</td>
<td>VP</td>
<td>F</td>
<td>VP</td>
</tr>
</tbody>
</table>

For more in-depth yield analysis, go to: http://www.agsask.ca/agriculture/plants/winter_cereals/yield_selection/index.php

Note: CDC has an awned head and soft white kernels. Sunrise has soft red kernels.

As of 1 August 2013, the Canadian Grain Commission advises that the varieties CDC Clair, CDC Harrier, CDC Kestrel, and CDC Raptor will be moved to the Canada Western Red Winter class to the Canada Western General Purpose class.

As of 1 August 2014, CDC Falcon will be moved from Canada Western Red Winter class to Canada Western General Purpose class.
C. Identify Disease = Scout

- See symptoms before apply fungicide
  - Ascochyta blights
  - Leaf spots in cereals
  - Powdery mildew in pea
- Forecast for fungicide application before see symptoms
  - Sclerotinia – use checklist
  - Fusarium head blight
D. Treat/Prevent

Fungicides:

- May need more than one application
  - 10-14 days protection
  - rotate active ingredients
- Contact vs systemic fungicides
- Protect healthy tissue does not repair damage
- Apply to the tissues you want to protect
  - Typically do not move from one leaf to another
  - Target upper canopy leaves

Picture from Kelly Turkington, AAFC
Timing is important

Cereal Leaf Spots
- tan spot, spot blotch, net blotch, stagnospora, septoria
- Wheat – protect top 2 leaves
- Barley – protect top 3 leaves

FHB
- Wheat – early flowering ideal (heading to 50% flower - 7-10 days window )
- Barley – just before or at head emergence
Timing is Important

- Sclerotinia (canola)
  - 20-50% bloom stage
  - 30% bloom ideal
  - When crop is yellowest
- Sclerotinia (pulses)
  - Early flower or 7-14 days after 1st fungicide application or when see symptoms
### Foliar Fungicides (Grain Crops)

<table>
<thead>
<tr>
<th>Reasons to Spray</th>
<th>Reasons Not to Spray</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected yield loss ($) &gt; cost of fungicide</td>
<td>Expected yield ($) &lt; cost of a fungicide</td>
</tr>
<tr>
<td>Expected net return = ++</td>
<td>Expected net return = ---</td>
</tr>
<tr>
<td>Favourable environmental conditions</td>
<td>Less favourable environmental conditions</td>
</tr>
<tr>
<td>Poor rotation</td>
<td>Good rotation</td>
</tr>
<tr>
<td>Susceptible variety</td>
<td>Resistant variety</td>
</tr>
</tbody>
</table>
Insects
Cabbage Seedpod Weevil
Cabbage Seedpod Weevil Life History

**WINTER**

**SPRING**

- Adults overwinter

- Flight 12°C

**SUMMER**

- Feeding on floral buds, seeds and young seedpods. Egg-laying in young pods.

- Larval development in seedpods.

**FALL**

- Pupation in the soil.

- Adults emerge in August, feed, and overwinter in leaf litter.
Cabbage Seedpod Weevil Life Stages

- Adult
- Egg
- Larva
- Mature Larva
Cabbage Seedpod Weevil
2013 Survey

Weevils per 25 sweeps
0
1 - 3
4 - 9
10 - 30
31 - 90
> 90

Record year for cabbage seedpod weevil in Saskatchewan
Higher populations expansion N of the Sask. River
Expansion E into traditional” canola growing areas
Diamondback moth

Moths originating from the south later in 2013 (3rd week in April) vs. 2012 (early April)

2014 – wait and see
Leafhopper (Macrolestes quadrilineatus)

Aster yellows
Prevalence 2006-2013  Incidence 2006-2013

Prevalence Graph
Incidence Graph
Grasshoppers

Melanoplus bivittatus  
(Two-striped)

photo - Dan Johnson
Non-pest Grasshopper Species

The following indicates non-pest grasshoppers:

- with knobs on antenna
- adult early in season
- with red, yellow or orange wings
- any seen before May 25
- any that sing loudly while sitting
- any that crackle when they fly
Immature Grasshoppers

Wing pads
- 1st to 3rd point down
- 4th and 5th point up
Cutha armyworm

Populations decreased in 2013 Last year of current outbreak?

- For most areas
Swede Midge

Present in the Province for more than 5 years

Previous history in canola on the Prairies until 2012

Factors affecting swede midge

Moisture – higher moisture favours midge

Temperature – mild winter 2011-12

Existing populations – over-winter as cocoons in the soil

Number of generations (3 to 4 overlapping generations reported in Ontario)

Search – surveys to determine distribution

- biology, economic threshold, management
Wedge midge damage canola (Ontario) – damage to growing point bouquet” of pods
Saskatchewan symptoms:
- florets affected
- Most severe damage in field margins

Petals ‘glued’ together
Swede midge larvae in canola flower
Multiple sterile florets

Sterile floret - petals retained and dessicated

Multiple sterile florets
Fede midge

Multiple generations

- 4 in Ontario
- 3 in Sask.?
heat Midge

Monitoring

Susceptible stage – head becomes visible until the crop flowering (anthesis)

During anthesis resistance increases due to increase of ferulic acid in head

Start of susceptibility

Wheat no longer susceptible
Cutworms
Cutworm ID

- Hardened head capsule and thoracic plate
- Crochets (velcro like hooks on abdominal legs)
New Research on Cutworms

Develop molecular tools for species identification
proved knowledge on:
life histories of various species on the Prairies (e.g. dingy cutworm, bristly cutworm)
Natural enemies – parasites and diseases
proved extension tools for producers and
trologists
supported by the Canola Council of Canada through the
Canola Agronomic Research Program (CARP) / skCanola
Sea Beetles

- Low growing conditions in the spring
- Seed treatments effective for set period (21-35 DAS)
- Acaricidal sprays required in some cases
Ed Flea

Species shift”

Shifted flea beetle members increasing most areas
Proportion flea beetle species April-June, Saskatoon Research Centre

Source – Dr. Julie Soroka, Agriculture and Agri-Food Canada, Saskatoon
Summary for 2014

• Weather will dictate disease pressure
• Variety choice important for leaf diseases
• Fungicide applications if crop yield potential is good and risks are high
• Insects – scout regularly
• Watch PHI with pesticides
• If in doubt send it out (in…to get ID)
Industry Crop Protection Laboratory

Lab handles:
- Disease Diagnosis: visual & plated
- Clubroot: visual and DNA (soil)
- Insect and weed ID
- Herbicide Injury
- Herbicide Resistance Testing

Honourable Lyle Stewart, Minister of Agriculture, during the grand opening of the PCR lab in Regina

agriculture.gov.sk.ca/Crop_Protection_Lab
www.gov.sk.ca