Crop Damage – More Than Just Herbicides

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Herbicide Injury

• Agronomists generally well trained in herbicide symptomology

• Injury generally results from additive environmental (abiotic) stresses
  • “DO NOT apply fenoxaprop 2 to 3 days prior to, or following, temperatures of 3°C or lower as crop injury may occur.”
• Fenoxyprop (Puma, Bengal, any kind of cat)
  • “Durum wheat, forage grasses and barley may experience some initial, temporary stunting and yellowing that rarely results in yield loss. Injury is more likely under stress conditions”.

• Metribuzin (Sencor, Tricor)
  • “Heavy rainfall soon after application to peas, lentils and chickpeas can result in stand reduction on soils with less than 4 percent organic matter”.
Too much water!!
Not enough water!!

Leaf flipping in soybean

Photo credits: Dr. R. Bueckert
Heat and drought stress!

Pod abortion

Photo credits: Dr. R. Bueckert
Which of these *Brassica* plants have PSII (Xylem mobile) herbicide injury?

A. Photo 1

B. Photo 2

C. Both

D. Neither
Manganese / aluminum toxicity

Photo credit: Jessica Weber, WARC, Scott, SK.
The effect of soil pH on nutrient availability.

Soil pH at Scott Research Farm Top 15 cm– 4.5 to 5.5
Scott soils: mean Mn 51 ppm Range: 16-237
Aluminum availability may also be issue!

<table>
<thead>
<tr>
<th>Ecoregion</th>
<th>Number of Sites</th>
<th>Copper (mg/kg)</th>
<th>Iron (mg/kg)</th>
<th>Manganese (mg/kg)</th>
<th>Zinc (mg/kg)</th>
<th>Clay (%)</th>
<th>Organic Matter (%)</th>
<th>pH</th>
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<tbody>
<tr>
<td>Peace Lowland</td>
<td>10</td>
<td>1.1</td>
<td>160</td>
<td>12.9</td>
<td>7.8</td>
<td>36</td>
<td>6.2</td>
<td>6.5</td>
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<tr>
<td>Boreal Transition</td>
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<td>0.8</td>
<td>123</td>
<td>16.1</td>
<td>3.5</td>
<td>26</td>
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<tr>
<td>Aspen Parkland</td>
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<td>0.7</td>
<td>106</td>
<td>20.1</td>
<td>4.7</td>
<td>21</td>
<td>6.2</td>
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<tr>
<td>Moist Mixed Grasslands</td>
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<td>0.8</td>
<td>98</td>
<td>24.7</td>
<td>2.0</td>
<td>18</td>
<td>5.0</td>
<td>6.2</td>
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<tr>
<td>Fescue Grasslands</td>
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<td>28.9</td>
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<tr>
<td>Mixed Grasslands</td>
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<td>0.9</td>
<td>39</td>
<td>11.8</td>
<td>0.8</td>
<td>24</td>
<td>1.8</td>
<td>7.2</td>
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Halo on cotyledon from seed treatment

http://www.canolawatch.org/2013/05/29/halo-of-yellow-around-cotyledons/

Greg Sekulic, Canola Council
Triazine soil active herbicide in mustard

Photo Credit: Jaime Barton, U of S
Which of these Pea plots did not receive POST- Odyssey?

A. Photo 1  
B. Photo 2  
C. Photo 3  
D. Can’t tell
Yellow Flash in Field Pea from Odyssey

• Looked at effect of timing
• Applied 2X rate of Odyssey at 1-2 node, 5-6 node, and >8 node at Saskatoon, 2014 and 2015.
Chlorosis Ratings on Field Pea after 2X application of Odyssey. June 24, 2014

![Diagram showing chlorosis ratings at different stages and times for untreated and treated plants. The diagram includes bars for 21 DAA and 12 DAA stages for different node counts and a bar for 'Not sprayed yet'.]
Pea tolerance to Odyssey timing – 2X rate -2014
Mean of 2 cultivars (CDC Golden and CDC Sage)
Pea tolerance to Odyssey timing – 2X rate -2015
Mean of 2 cultivars (CDC Golden and CDC Sage)
Odyssey applied to CDC Golden at 2X rate 1-2 node 2015

Odyssey applied to CDC Golden at 2X rate at >8 node - 2015
Photo credit: Sherrilyn Phelps, Sask Pulse Growers
Conclusions from Odyssey study

• Yellow flash (chlorosis) from Odyssey application was transient and generally did not result in a yield reduction when applied before the 6-node stage.
• Adverse environments after application can result in injury even when application timing is made within label directions.
• Symptoms from waterlogging can resemble “yellow flash”.
• Late application (beyond the 6-node stage) resulted in 3 to 12 days in maturity, and a slight yield drag in one year of the study.

Glyphosate alone
Glyphosate alone

Glyphosate & Express Pro

Increasing Moisture

Glyphosate alone
Heat 80 acre rate

Inferno Duo

Pre-Pass
How much yield reduction do you think the middle plot will experience compared to the plot on left?

A. <10%
B. 11-20%
C. 20-30%
D. >30%
Anthocyanin expression
Which of these have Group 2 injury?

A. Photo 1
B. Photo 2
C. Photo 3
D. Photo 1 & 2
E. All
Other causes of canola purpling


Sulphur deficiency
Which of these is sulfentrazone carryover on wheat?

A. Photo 1
B. Photo 2
C. Photo 3
D. None
Wheat heads caught in the boot can be caused by:

A. Improper timing of phenoxy herbicide application
B. Glyphosate drift
C. Cool temperatures at heading
D. Genetic trait
E. All of the above

E. All of the above
Which of the following has Infinity carryover?

A. Pea plants
B. Canola
C. Fababean
D. All of them
E. A & C
Albinism – genetic mutation

Pea Photos credit: Joshua Moats, FP Genetics
Fababean photo credit: Sherrilyn Phelps, Sask Pulse Growers
This is herbicide injury on Fababean!

Photo credits:
Sherrilyn Phelps, Sask Pulse Growers
Viper Injury

Frost Injury

Chocolate spot

Photo credits: Sherrilyn Phelps, Sask Pulse Growers
Blast from the past: “Stacking” of herbicide residues

- Research in early 2000’s found that under some environmental conditions that “back-to-back” application of residual Group 2 herbicides could result in additive or synergistic injury.
2004 - Photos taken about 21 days after in-crop treatment

Check

51% groundcover

Sundance applied in-crop

45% groundcover

Odyssey applied previous year (2003)

50% groundcover

Odyssey (2003) / Sundance in-crop

31% groundcover
Herbicide Stacking – Take home

• Group 2 – only occurs with very residual herbicides: Pursuit, Assert and Sundance (no longer available);

• Layering – research required to ensure “layered” herbicides don’t result in additive crop injury.
The lesions on these leaves are caused from:

A. Frost damage  
B. PPO inhibitor damage  
C. Insect damage

33% 33% 33%
Summary

• Consider weather, other stresses when diagnosing
  • Many stresses are additive / synergistic
  • Frustrating for farmer and agronomist – how much damage is herbicide / how much is environment?
Drought

Drought + >30 C temps

Dicamba injury