



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!!



Photo: Dr. R. Bueckert



Photo credit: S. Phelps

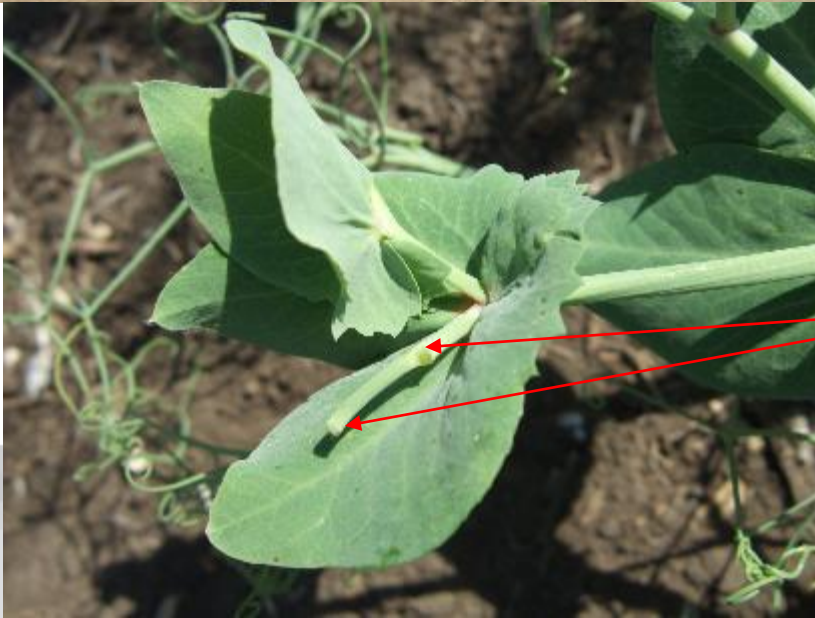
Not enough water!!

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?

Photo 1



A. Photo 1

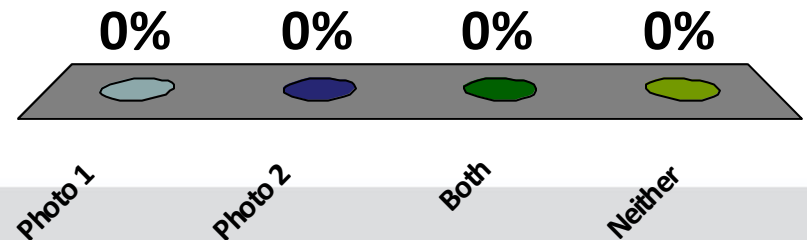
✓ B. Photo 2

C. Both

D. Neither



Photo 2



Manganese / aluminum toxicity



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CSI: Crop Symptom Investigation: diagnosing manganese toxicity

A classic case of how crop diagnostics identified a unique crop production problem.

September 10, 2011
By Bruce Barker

f g+ t in eplus



The field problems presented to Emile deMilliano, a certified crop advisor and manager of Agronomic Services with Vterra at Fort Saskatchewan, Alberta, was a head-scratcher. Symptoms of poor canola growth had been reported in a few fields in northern Alberta in 2009 around Mayerthorpe, and a few more in 2010. Whereas most showed minor symptoms, one field in particular at Lac La Biche in 2010 had about one-third of the field affected.

The symptoms showed up around the three to four

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FIELD CROP DISEASE SUMMIT

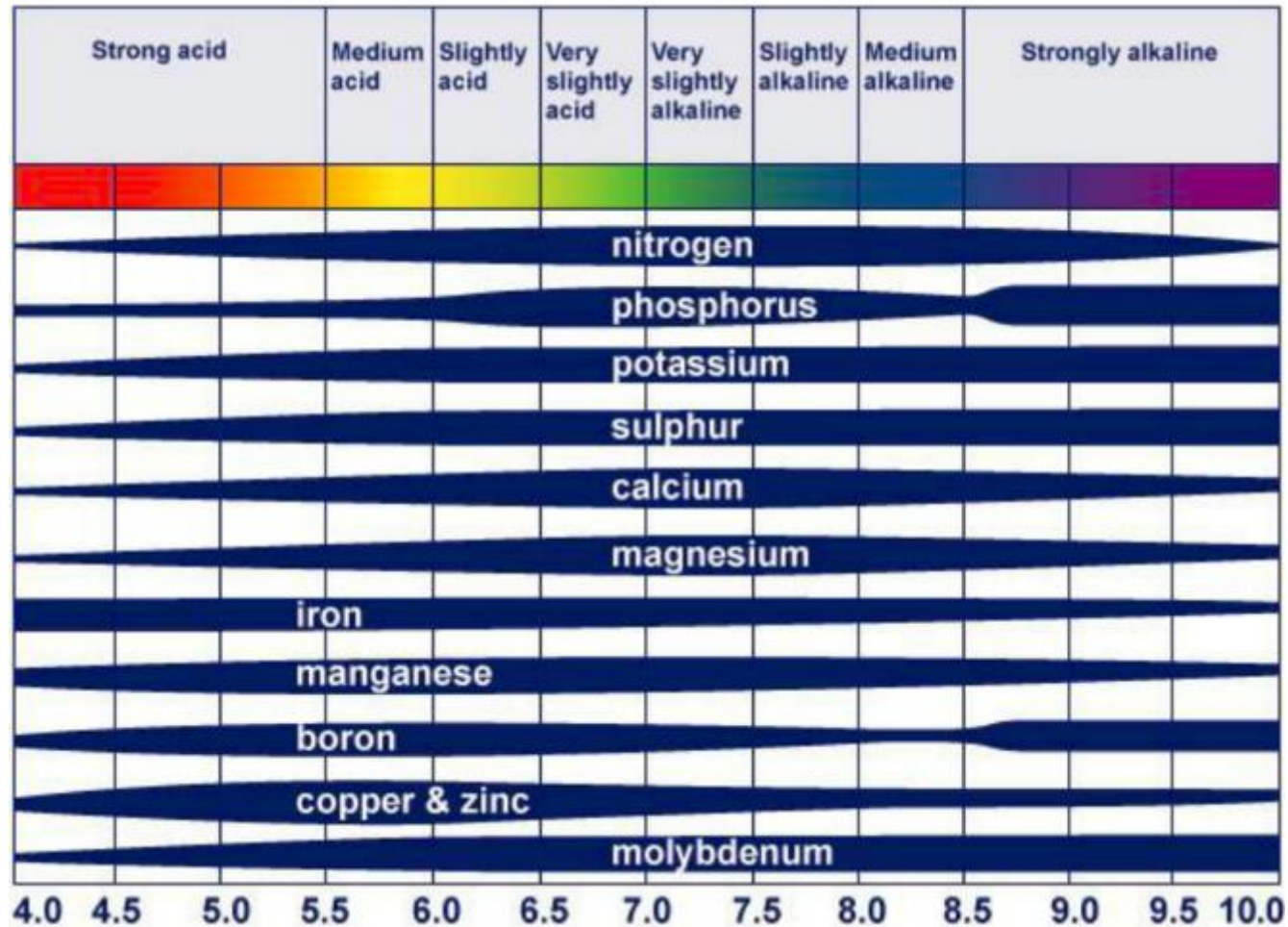
MOST POPULAR

- Shallow banding N risks volatilization loss

Photo credit: Jessica Weber, WARC, Scott, SK.

www.usask.ca

The effect of soil pH on nutrient availability.



Ecoregion	Number of Sites	Copper (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Zinc (mg/kg)	Clay (%)	Organic Matter (%)	pH
Peace Lowland	10	1.1	160	12.9	7.8	36	6.2	6.5
Boreal Transition	8	0.8	123	16.1	3.5	26	5.5	6.3
Aspen Parkland	9	0.7	106	20.1	4.7	21	6.2	6.3
Moist Mixed Grasslands	5	0.8	98	24.7	2.0	18	5.0	6.2
Fescue Grasslands	2	1.3	92	28.9	2.3	29	5.7	6.3
Mixed Grasslands	8	0.9	39	11.8	0.8	24	1.8	7.2

Scott soils: mean Mn 51 ppm Range: 16-237
Aluminum availability may also be issue!

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?

Photo 1

- A. Photo 1
- B. Photo 2
- C. Photo 3
- D. Can't tell



0%

Can't tell

usask.ca

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.



Untreated



1-2 Node



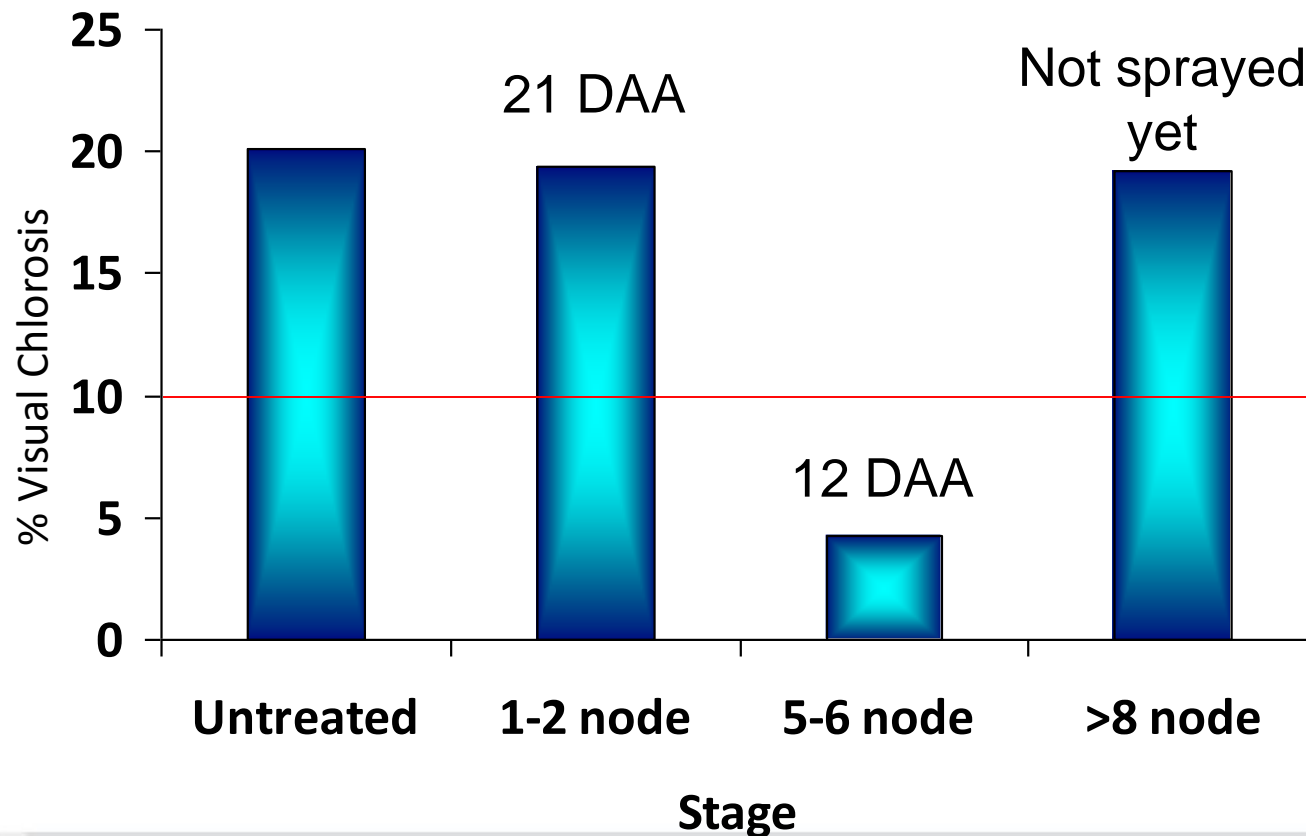
5-6 Node



8-10

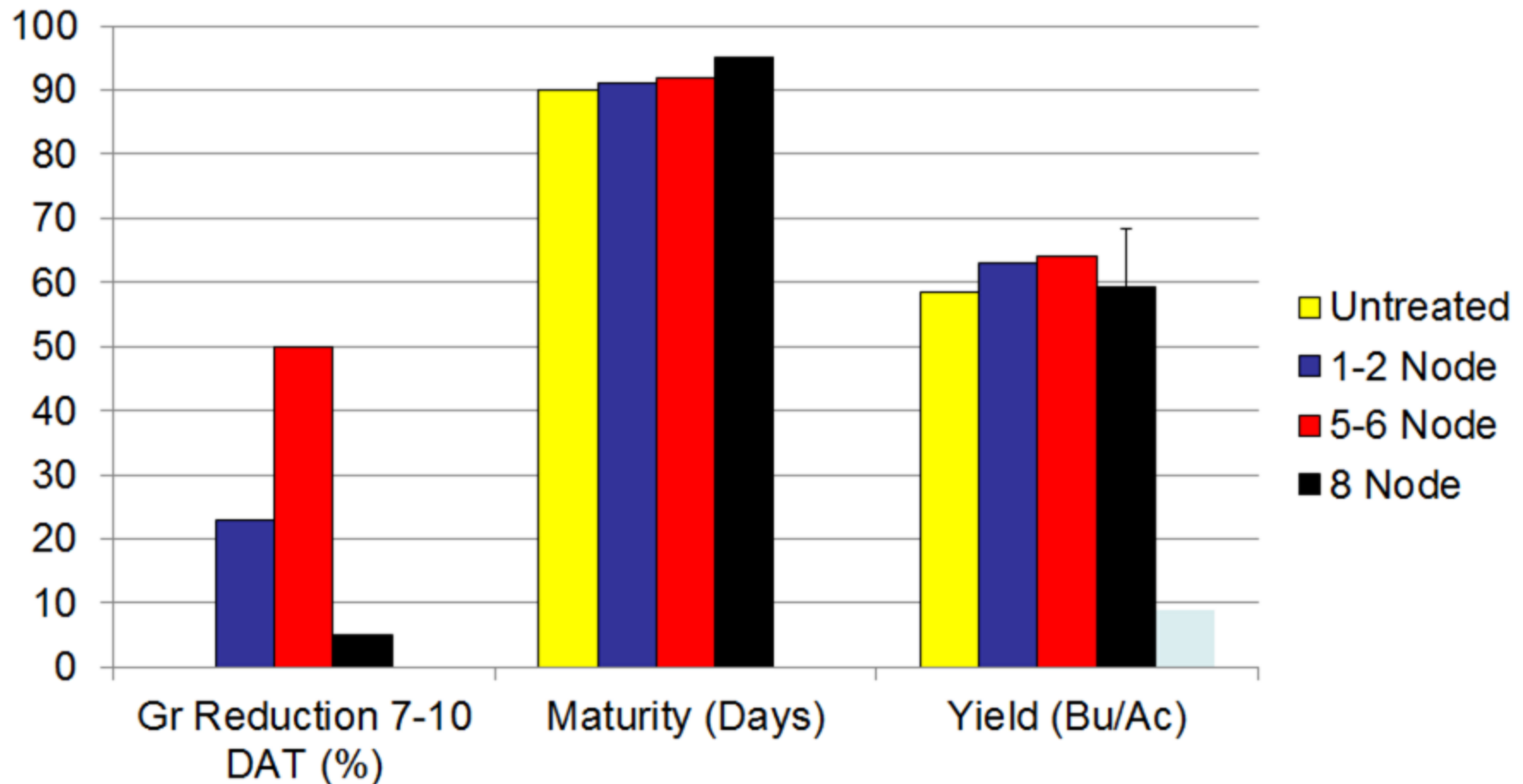


Chlorosis Ratings on Field Pea after 2X application of Odyssey. June 24, 2014



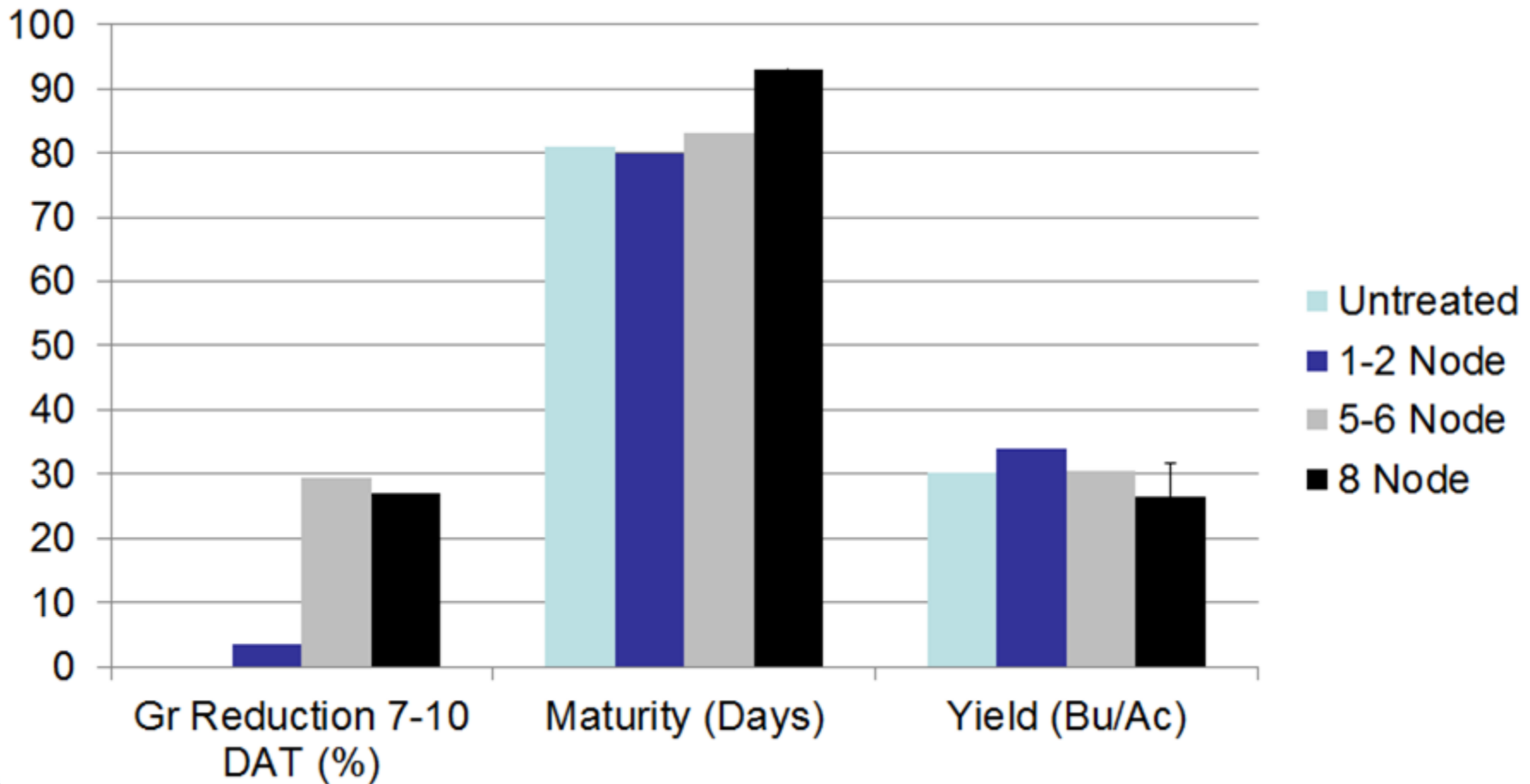
Pea tolerance to Odyssey timing – 2X rate -2014

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



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.

Additive Effects of Waterlogging and PRE – Herbicide Injury: Source: Doug Fehr. 2012



Glyphosate & Express Pro


Increasing Moisture

Glyphosate alone



Glyphosate alone

Glyphosate & Express Pro



Inferno Duo

G. & Express Pro

Pre-Pass



Heat 80 acre rate

Pre-Pass

Inferno Duo

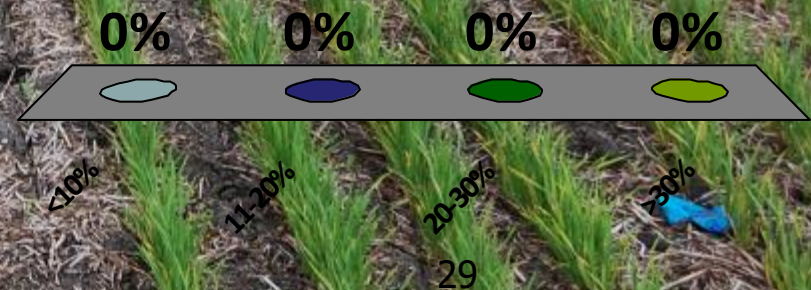


Inferno Duo

Heat 80 acre rate

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



Dr. R. Bueckert

Which of these have Group 2 injury?

Photo 1



- A. Photo 1
- B. Photo 2
- C. Photo 3
- D. Photo 1 & 2
- E. All

Photo 2



Photo 3



0%

All

.ca

Other causes of canola purpling

<http://www.canolacouncil.org/canola-encyclopedia/weeds/herbicide-residue-drift-injury/>



Which of these is sulfentrazone carryover on wheat?

Photo 1



- A. Photo 1
- ✓ B. Photo 2
- C. Photo 3
- D. None

Photo 2



Photo 3



0%

0%

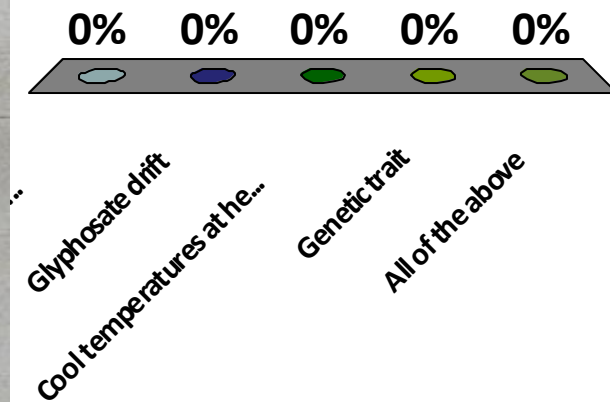
Photo 3

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

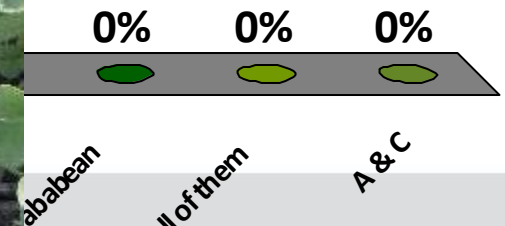




<http://www.mississippi-crops.com/2011/03/23/identifying-glyphosate-drift-injury-on-wheat-plants/>

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 Fababeans!



Photo credits:
Sherrilyn Phelps,
Sask Pulse Growers



Frost Injury



Viper Injury



Chocolate spot



Photo credits:
Sherrilyn Phelps, Sask Pulse Growers

Blast from the past: “Stacking” of herbicide residues

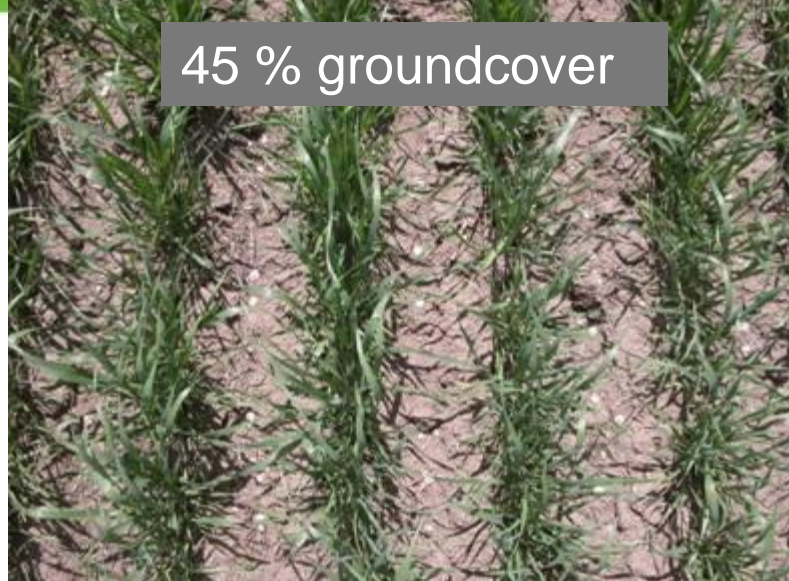
- Research in early 2000’s found that under some environmental conditions that “back-to-back” application of residual Group 2 herbicides could result in additive or synergistic injury.



51% groundcover

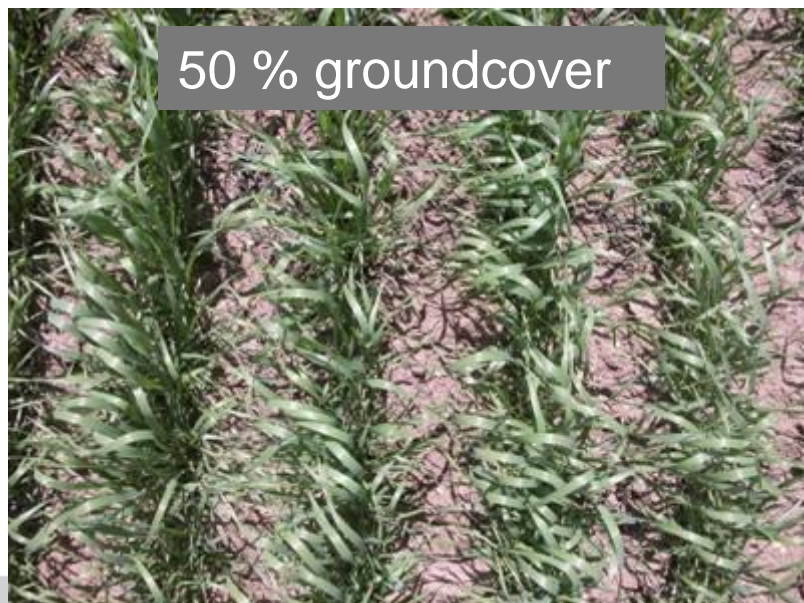
Check

2004-
Photos
taken
about 21
days after
in-crop
treatment



45 % groundcover

Sundance applied in-crop



50 % groundcover

Odyssey applied
previous year (2003)



31% groundcover

Odyssey (2003) /
Sundance in-crop

ca



Untreated



Odyssey 2 years prior



Assert 1 year prior



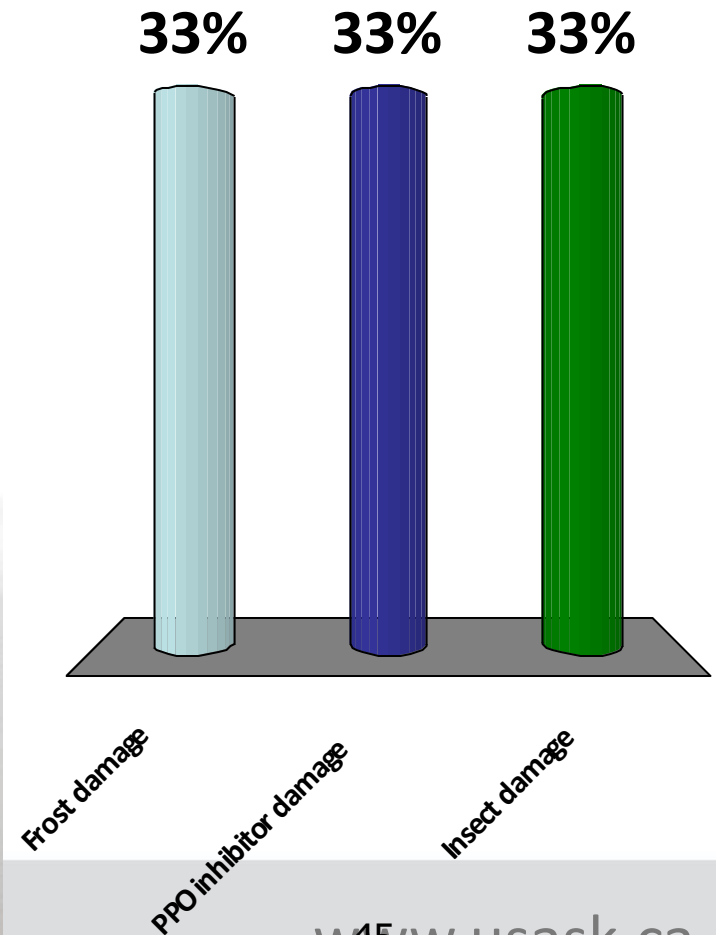
Odyssey -2 yrs / Assert -1 year

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



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