



Vikram Bisht, MAFRI

Herbicide Drift injury to Potato and Potential Seed Issues

Keystone Potato Producers Assoc.
Tuesday, 9th of April 2013

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Herbicide Injury possible through:

- **Drift** from nearby application
- **Mis-timed** – a bit late when there is already some emergence and ground has cracks due to just emerging sprouts or other reasons
- **Improperly cleaned** spray tank after herbicide application
- **Mis-application** – wrong field or product
- **Soil residue** – persistent herbicides



Is it COLD
or
HERBICIDE
issue?





- In some cases appears as virus disease
- The whole or part of plant may have abnormal leaves
- In some cases the newer foliage becomes normal

Unknown, 2011



2011 Simulated Drift Spraying

On Field Plants

1. Russet Burbank plants (5 weeks old)
2. Herbicides solutions at 0, 1, 10 and 20 % of application rate for a specific crop
3. Tubers were harvested and put in cold storage for 2012 planting.

Herbicides Field Tested in 2011

Group	Herbicide		Crop	Rate / acre
2	Odyssey	35% imazamox 35% imazethapyr	Clearfield Canola & lentils	320 ml
4	2, 4 - D	Ester 700 g/L	Cereals	17.3 g
9	Round-Up Weather Max	Glyphosate 540 g/L	RR crops	500 ml
10	Liberty 150 SN	Glufosinate ammon 150 g/L	Liberty Link Canola	1.35 L

Concentrations

0 % (Water)	1 %	10%	20%
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Field Sprayed, 5 weeks after emergence



Liberty

1. Odyssey
2. 2,4-D
3. Glyphosate
4. Liberty

Liberty

2011 Harvest





Odyssey



predict R². Step 4: Repeat steps 1 to 3 in at least 5 representative areas and average values.



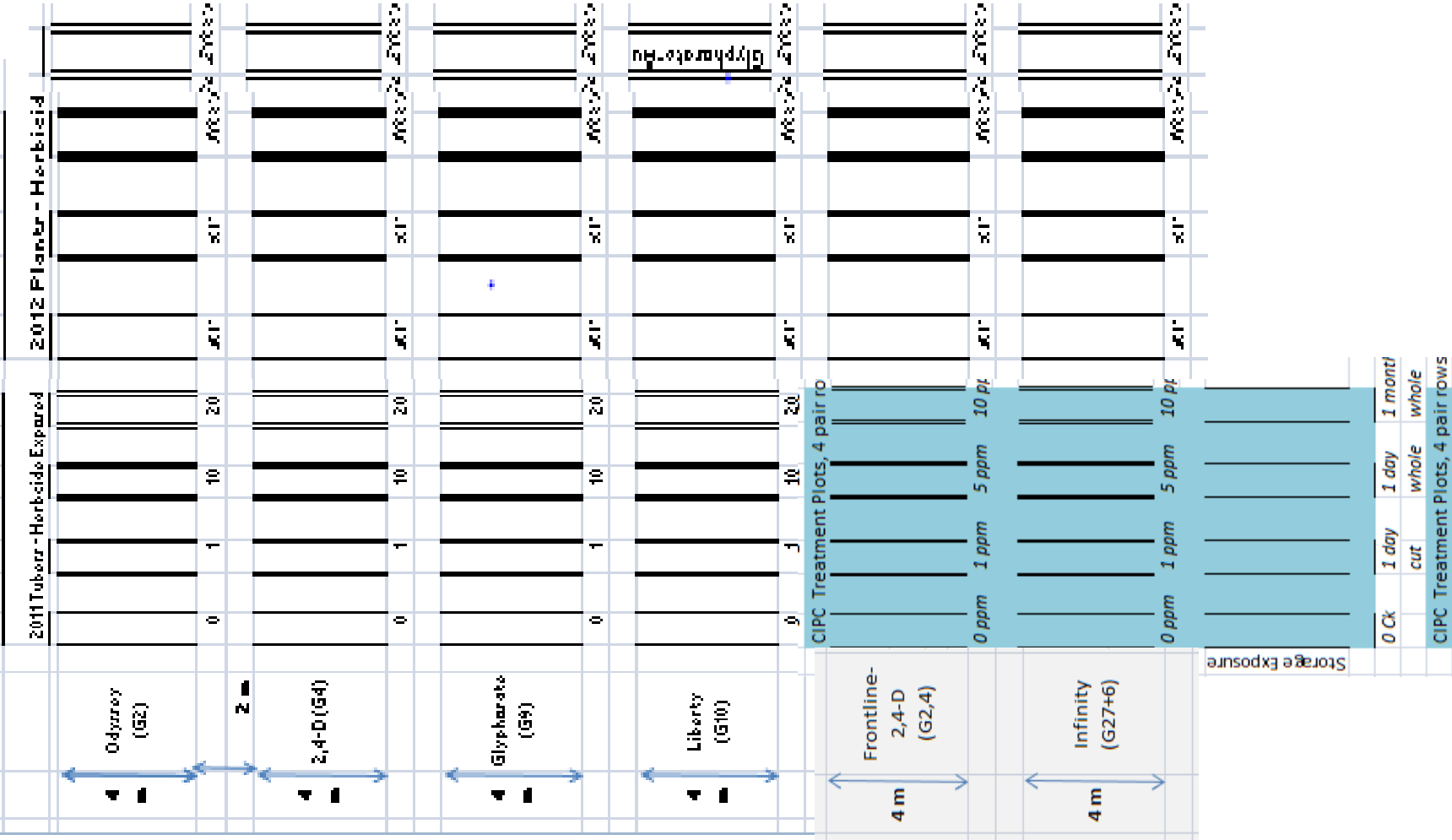




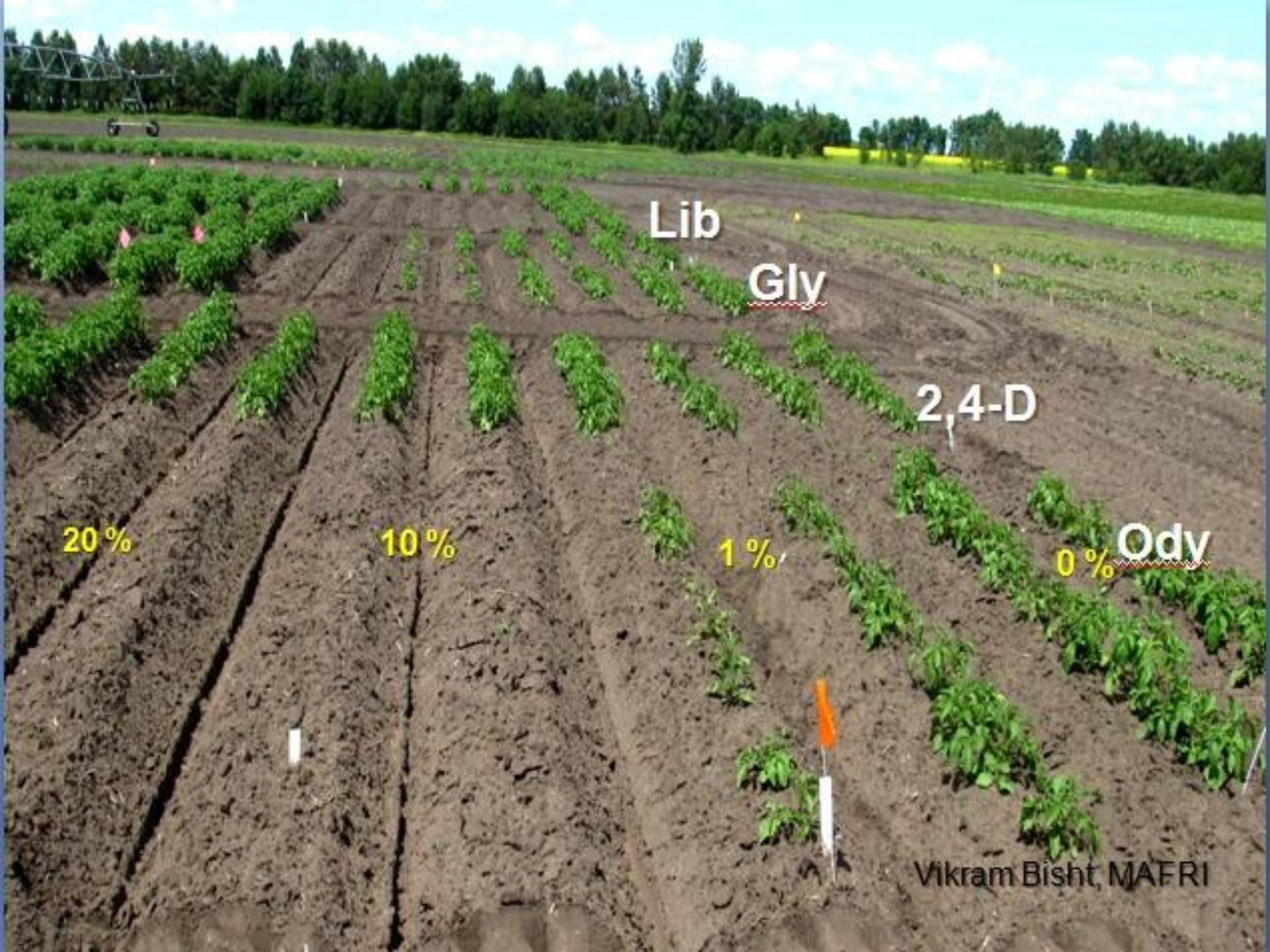




Herbicide Drift Exposure Demo Tri:



2011 & 2012 Herbicides



Lib

Gly

2,4-D

Ody

20%

10%

1%


0%

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Glyphosate in seed

- 1. Slow emergence**
- 2. Removes apical dominance – causing Multiple shoots (Candelabra)**

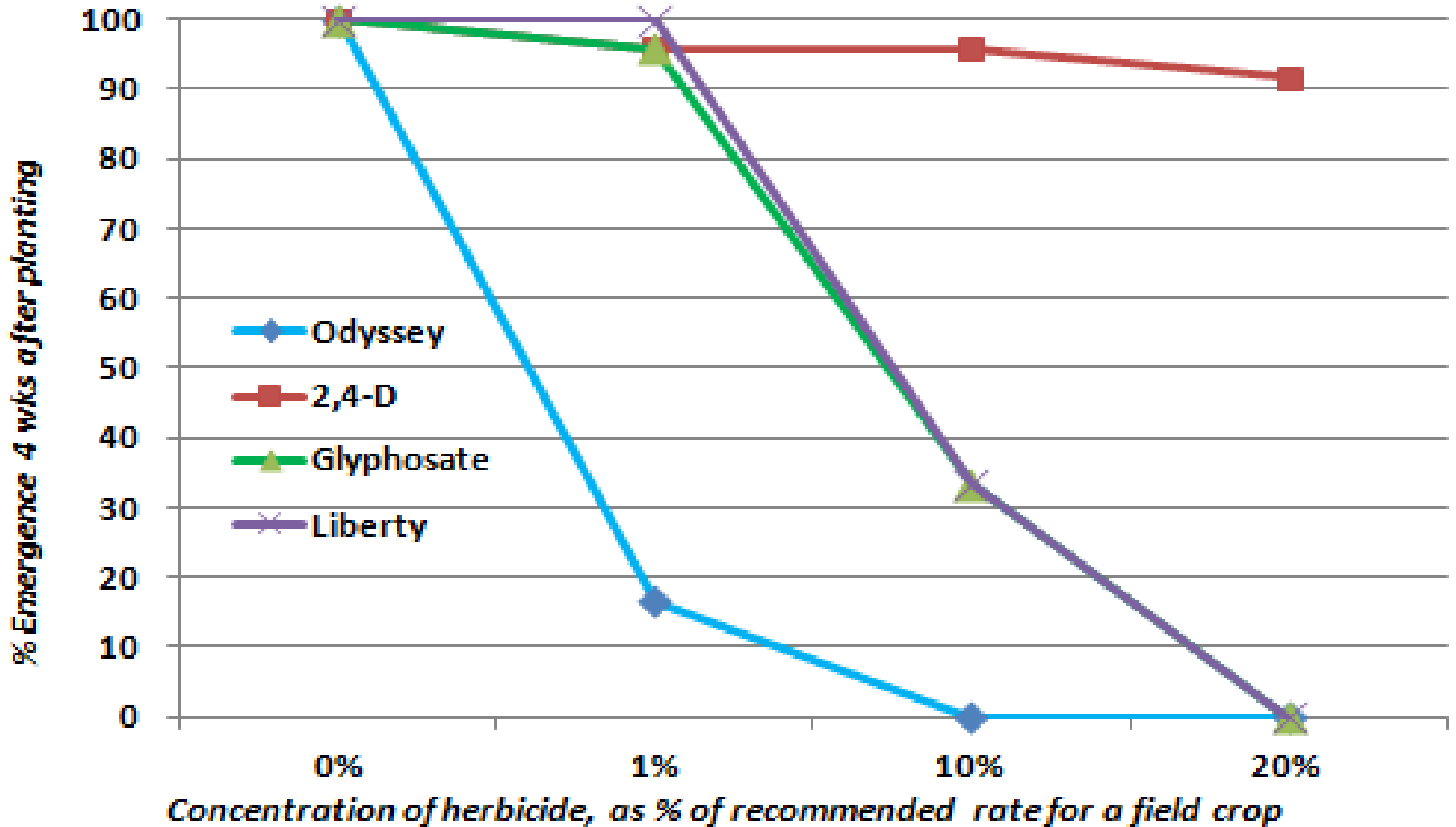
A photograph showing a young plant with green leaves and a reddish stem growing in dark, rich soil. A white plastic label is stuck in the soil next to the plant, with the handwritten text "2,4-D" on it. The soil is dark and appears to be a loam or silt loam. In the background, other similar plants are visible, though they are out of focus.

2,4-D

No multiple shoots observed, from seed with 2,4-D

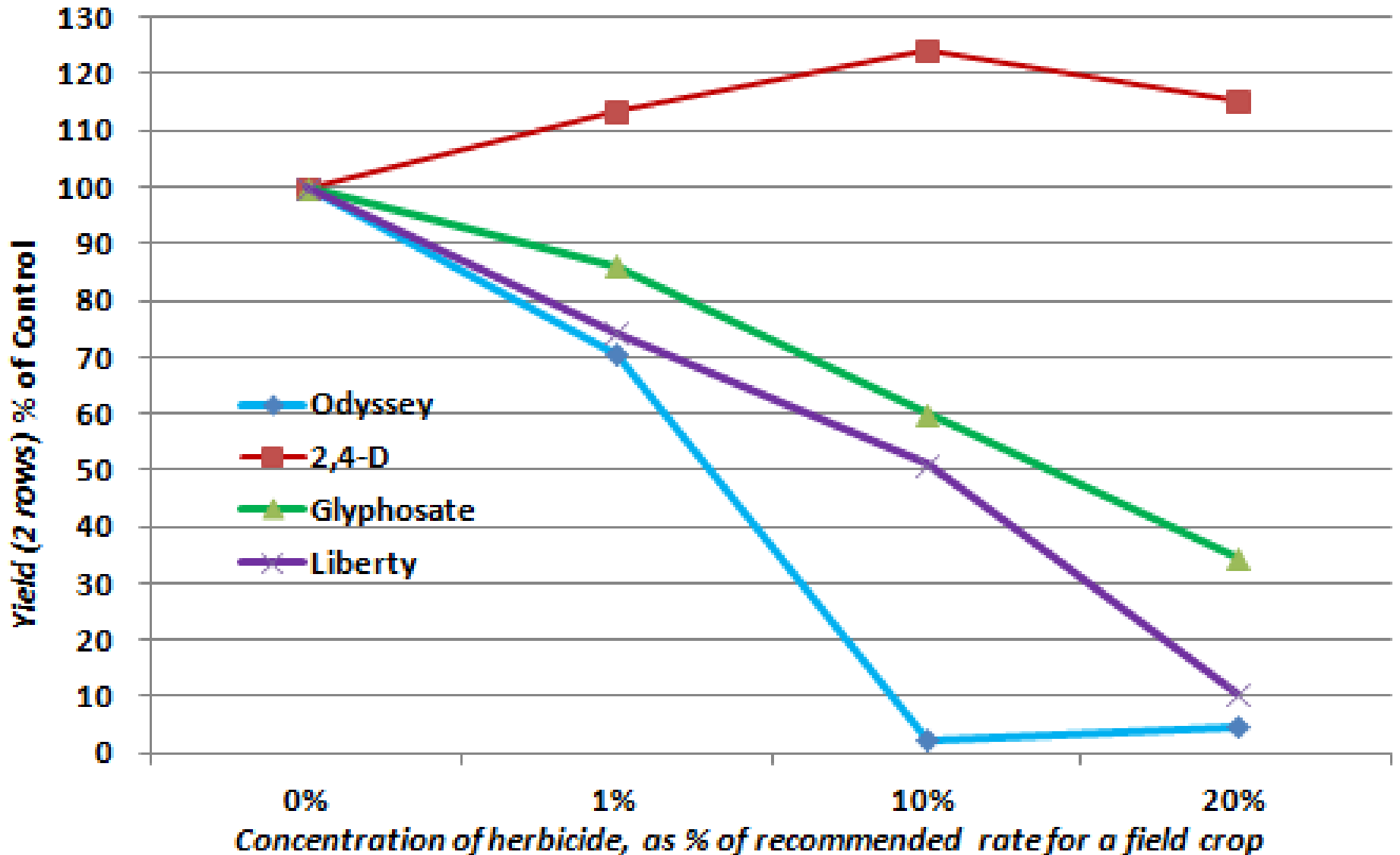


Emergence of Daughter Tubers of 2011 Drift Exposed Plants, Winkler 2012 crop



From 2 rows, with 12 tubers planted per row.

Yield (% of Control) from Daughter Tubers of 2011 Drift Exposed Plants, Winkler 2012 crop



Yield from 2 rows, with 12 tubers planted per row.



20 %

10 %

1 %

0 %

2012 Seed Planted for 2012 Spray

Odyssey, 20%



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Seed from Odyssey exposed plants,
unemerged in 2012 at Harvest

ATHOLO
Odyssey 10% 2011
2012 SEP20

Odyssey 20%
2012 SEP20

2012 Sprayed Odyssey & Harvested




A
2012
Odyssey 0%
5 2-05



A
2012
Odyssey 10%
7 1180



A close-up photograph of a tomato plant. The leaves are mostly green but show significant yellowing and chlorotic spots, particularly on the lower and inner leaves, which is characteristic of nutrient deficiency or herbicide damage. A white plastic label is stuck into the soil, with the text "Glyphosate 20%" written in black marker. The background is filled with more green foliage, suggesting a field or greenhouse setting.

Glyphosate
20%

glyphosate

10%

LATE



20%
Liberty

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Frontline
-2,4D

(G2+4)

2012 Sprayed Frontline-2,4-D
& Harvested



Postage
E
2012
Frontline 1%
6



Postage
E
2012
Frontline 0%
5
lot 2



2012
Frontline 20%
8



E
Postage
2012
Frontline 10%
7
14-75



Infinity

G27+6

Infinity
G27+6

2012 Sprayed Infinity & Harvested



F
Portage 2012 Infinity
Frontline 1%
6



F
Portage 2012 Infinity
Frontline 0%
5



F
Portage 2012 Infinity
Frontline 20%
8 11.70



F
Portage 2012 Infinity
Frontline 10%
7 15.39

2011 Margin chlorosis =
Infinity Damage !



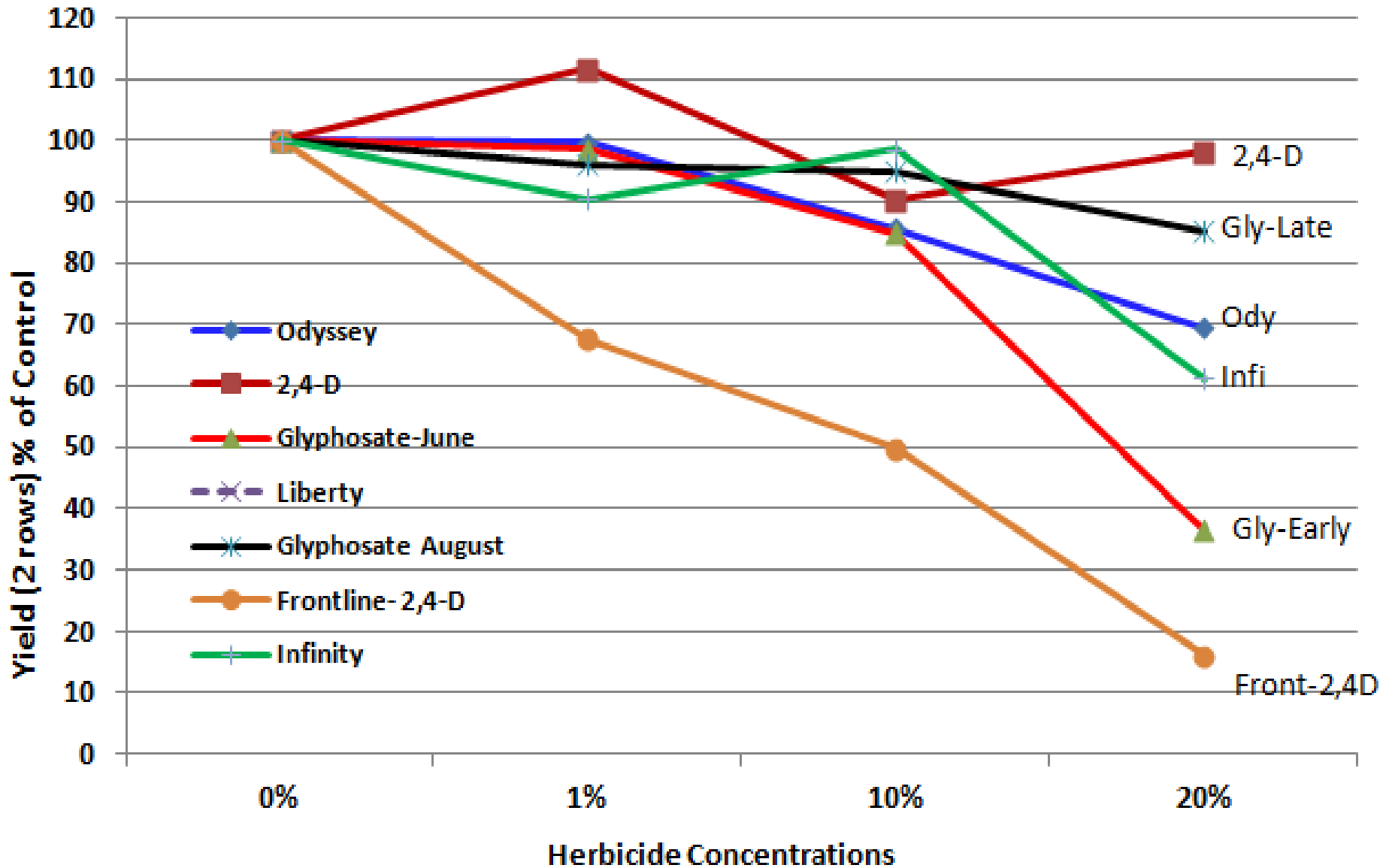
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2nd generation GM soybean and other crops:
with glyphosate + dicamba tolerance – so
potential injury



Glypho + Dicamba
20%

Impact of Current season simulated spray drift on RB yield, Winkler 2012



Yield from 2 rows, with 12 tubers planted per row.

2012 Harvest in Cold storage for 2013 summer planting



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Proposed Plan for 2013

	Group	Herbicide Used	
1	2	Odyssey	Clearfield Canola
2	4	2, 4- D	Cereals
3	9	Roundup	RR crops
4	10	Liberty 150 SN	L-Link canola
5	2, 4	Frontline 2,4 D	Spring Wheat
6	27 + 6	Infinity	Cereals
7	4	Dicamba	Cereals
8	4, 9	Rustler (Dicamba+Glyphosate)	Pre-seeding cereals

1. Plant seed from 2011 and 2012 crops to study effect on daughter & grand-daughter tubers
2. Use 8 herbicides to study impact on foliage, yield and seed performance

Herbicide Injury in Grower Fields 2012

Group 2 Herbicides

AcetoLactate Synthetase / AHAH Inhibitors

1. Assert (imazamethabenz)
2. Odyssey (35 % imazamox, 35% imazethapyr)

Grower fields –

Group 2 injury symptoms



Potato 2012
Severely affected
in sandy areas of field

- 1. Delayed emergence**
- 2. Deformed foliage**

Group 2 : Assert
Soil applied 2011
on sunflower



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Potato 2012, Assert soil applied 2011

Group 4 Herbicides

Growth Regulators

1. 2, 4 – D
2. Dicamba

**Grower fields –
Group 4 injury symptoms**



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Group 4 Herbicides

Growth Regulators – Dicamba, 2,4-D



Improper clean-up of spray tank



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Group 10 Herbicides

Glutamine synthetase Inhibitors

1. Liberty 150 SN, 200 SN
(glufosinate ammonium)

Grower fields –

Group 10 injury symptoms



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Group 10 Herbicides

Glutamine synthetase Inhibitors

Liberty Link Canola

Potato

Liberty 150 SN, 200 SN
(glufosinate ammonium)



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Group 9 Herbicides

EPSP synthetase Inhibitors

1. **Glyphosate** – several brands

Grower fields –

Glyphosate injury symptoms



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Glyphosate

1. **Highly soluble in water, unaffected by pH**
2. **Adsorbed by soil particles, degradation mostly microbial**
3. **Accumulates in growing points; systemic movement up/down**
4. **Mode of Action – cessation of synthesis of amino acids, phenolic compounds and chlorophyll, followed by reduced protein synthesis, growth and premature cell death.**
5. **Activity in Soil – 47 days $\frac{1}{2}$ life**
6. **Leaching – Mostly very limited. [Pest Manag Sci.](#) 2008 Apr, 64(4):441-56. In Sandy soils & high rainfall.**

Glyphosate application in just emerged field or with growth cracks





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Field with glyphosate seed carry over



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Glyphosate current season spray on a sandy field – could have had some emerged or nearly emerged sprouts *or rain or irrigation soon after planting.*

Daughter tubers from such plants has been collected.



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Heavy and light dosage of glyphosate on neighbouring plants

**Foliage sprayed showed symptoms and stayed on,
new foliage did not show signs of damage**



Potential Solutions to Herbicide Injury

- Spray when drift injury potential is low –wind speed and direction
- Drift reducing supplements: nozzles, shields, adjuvants
- Ensure proper cleaning of spray equipment after herbicides
- Ensure proper timing – zero emergence & no ground cracks.
- Proper crop rotation after herbicides with soil residual activity
- Other: Follow pesticide label



Thanks for the Support and Efforts

Leon Jarvis

Darren White

Tom Gonsalves

Curtis Cavers, and CMCDC staff

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