Today’s Agenda

• Review of glyphosate
• Off-site movement of glyphosate
• Symptoms of glyphosate in plants
• Symptoms of glyphosate residues in seed
• How to manage glyphosate problems
Glyphosate

- Herbicide introduced in 1974 by Monsanto
- “Once in a lifetime herbicide”
  - Activity on grasses and broadleaf plants
  - Low mammalian toxicity
- Registered in 130+ countries and approved for weed control in 100+ crops
- In most cases does not carryover in soil
Glyphosate Carryover in Soil

• Glyphosate binds rapidly in soil and is degraded by soil microbes.

• Glyphosate has been reported to carryover in the soil, but under specific conditions:
  – Applications were ≤ 35 before planting
  – 10x the labeled rate applied pre-emergence reduced yield in wheat
  – Sandy soils with low pH and high P-levels injured soybean and tomato plants

(Bott et al., 2011; Cornish, 1992; Moechnig, et al., 2012)
Movement of Glyphosate

• Translocates throughout the potato plant

• Reaches highest concentration levels in potatoes within four days (Smid and Hiller, 1981)
Glyphosate Uses

• Glyphosate-resistant alfalfa, canola, corn, soybean, and sugarbeets
• Pre-harvest treatment on small grains and canola
• Spot treatments around or within fields
• Rights-of-way, roadsides, railways, and around homes
How Seed Potatoes can be Exposed to Herbicides

- Particle drift (including inversions)
- Contamination of spraying equipment
- Misapplication
- Volatilization
# Particle Drift

## Influence of droplet size on potential distance of drift

<table>
<thead>
<tr>
<th>Droplet diameter (microns)</th>
<th>Type of droplet</th>
<th>Time required to fall 10 feet</th>
<th>Lateral distance droplets travel in falling 10 feet in a 3 mph wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Fog</td>
<td>66 minutes</td>
<td>3 miles</td>
</tr>
<tr>
<td>20</td>
<td>Very fine spray</td>
<td>4.2 minutes</td>
<td>1,100 feet</td>
</tr>
<tr>
<td>100</td>
<td>Fine spray</td>
<td>10 seconds</td>
<td>44 feet</td>
</tr>
<tr>
<td>240</td>
<td>Medium spray</td>
<td>6 seconds</td>
<td>28 feet</td>
</tr>
<tr>
<td>400</td>
<td>Coarse spray</td>
<td>2 seconds</td>
<td>8.5 feet</td>
</tr>
<tr>
<td>1,000</td>
<td>Fine rain</td>
<td>1 second</td>
<td>4.7 feet</td>
</tr>
</tbody>
</table>
Plant Response to Glyphosate

- Upper leaves may become yellow or necrotic
- Reduction in plant height, leaf size, and internode length
- Tubers can exhibit cracks and folds, or become misshaped
- Low levels of glyphosate may not cause visible injury in the foliage or tubers
High Concentrations of Glyphosate
Glyphosate in Seed Potatoes
Movement of Glyphosate

- Glyphosate will move to tubers and residues accumulate in the eyes causing sprouting problems the next year.
If Seed Looks Suspect to Herbicide Damage

- Sprout the seed in a dark room
- Grow out in a pot
- Send samples to lab for detection
Effects of Glyphosate Residues in Seed Potatoes
Symptoms of Glyphosate Residues in Seed Potatoes

- Erratic and slow emergence pattern
- Bending, twisting, and yellowing of leaves
- Multiple shoots from an eye
- Cauliflower or candelabra formation of shoots
- Enlarged shoots
- Prolific roots or reduced rooting
Glyphosate Levels

- Amount: 0.007 to 0.036 ppm glyphosate
Plant-to-Plant Comparison

+ glyphosate

Normal plant
Plant-to-Plant Comparison

Normal plant + glyphosate
Glyphosate Residues in Seed Potato

Seed pieces with glyphosate residues had a:

- 67% reduction in total yield (from 2.25 to 0.75 lb/hill)
- 50% reduction in tuber number (10 to 5 tubers/hill)
- 38% reduction in mean tuber weight (3.9 to 2.4 oz/tuber)
Do Glyphosate Residues Carryover to Granddaughter Tubers?

NO
Management Options

• Communication with your staff, neighbors, and local contractors.

• Consider having a dedicated sprayer for seed potatoes & ensure that custom applicators are using clean sprayers.

• Avoid planting field edges and leave suitable headland or plant border crops around potatoes.
REMEMBER!

SPRAYING
GLYPHOSATE?
WATCH OUT
FOR SEED POTATO CROPS!

More info in the Potato Council’s leaflet:
“Advice on the safe use of Glyphosate”

www.potato.org.uk

Potato Council is part of the Agricultural Horticultural Development Board (AHDB)

USE PESTICIDES SAFELY - READ THE LABEL EVERY TIME
Herbicide Injury Checklist

☐ Document potato injury symptoms and patterns.
☐ Check pesticide application history.
☐ Contact the applicator or chemical representative.
☐ Photograph injury symptoms.
☐ Send samples to lab for confirmation.
☐ Checking growing points to determine plant recovery potential.
☐ Count damaged plants to determine the extent of injury.
☐ Map areas of the field damaged.
☐ Keep records of crop yield losses.
ND and MN Laws

- **ND:** notify the applicator within 28 days or prior to 20% of crop is harvested.

- **MN:** file complaint within 45 days of suspected incident.
QUESTIONS?

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