Weed Resistance
Agenda

• Survey
• Resistant Maps
• Maximizing Glyphosate Performance
• Controlling Resistant Weeds in Rotation Crops
• Obtaining ACSC Sugarbeet Mix/Phen-Des and B & B Plus
Do you have weed resistance on your farm?

A. Yes
B. No
What weeds are difficult to control on your farm? (choose all that apply)

A. Common or Giant Ragweed
B. Kochia
C. Lambsquarter
D. Pigweed
E. Volunteer RR Crops
F. Waterhemp
G. Wild Buckwheat
H. Wild Oats
Are you using a second Mode of Action with your RoundUp technology in corn/soybeans? (choose up to 2)

A. No
B. Pre-emerge
C. Tank mix partner
Are you using Liberty Link or conventional seed trait’s in your rotation? (choose up to 2)

A. No
B. Liberty Link
C. Conventional (non-RoundUp)
In sugarbeets, what technology do you use for weed control?

A. Conventional
B. RoundUp Ready
C. Conventional herbicides (in or with-same field) RoundUp Ready technology
How do you manage “escaped” weeds? (choose all that apply)

A. Nothing
B. Cultivation
C. Hand Labor
D. Herbicide Rescue Treatment
E. Mower/Mechanical Puller
Areas and counties of ND and MN having known and suspected glyphosate-resistant weeds

2008

< 5% soybean fields gly-R C. Rag.

40 to 75% all acres have gly-R G. Rag. & 20 to 40% all acres have gly-R waterhemp

- Gly-R common ragweed
- Gly-R giant ragweed
- Gly-R waterhemp

Black symbols: confirmed resistant cases; Blue: highly suspected

Provided by: Drs. Jeff Stachler and Mike Christoffers
Areas and counties of ND and MN having known and suspected glyphosate-resistant weeds

25 to 40% soybean fields gly-R C. Rag.

30 to 95% all acres have gly-R G. Rag.

30 to 60% all acres gly-R waterhemp

10 to 30% soybean fields gly-R C. Rag.

5 to 20% all acres gly-R waterhemp

Gly-R common ragweed
Gly-R giant ragweed
Gly-R waterhemp

2009

provided by: Drs. Jeff Stachler and Mike Christoffers

Black symbols: confirmed resistant cases; Blue: highly suspected
Areas and counties of ND and MN having known and suspected glyphosate-resistant weeds

Gly-R common ragweed
Gly-R giant ragweed
Gly-R waterhemp

25 to 40% soybean fields gly-R C. Rag.
50 to 95% all acres have gly-R G. Rag.
30 to 90% all acres have gly-R waterhemp
5 to 80% all acres gly-R waterhemp

2010

10 to 40% soybean fields gly-R C. Rag.
30 to 60% all acres gly-R C. Rag.

Black symbols: confirmed resistant cases; Blue: highly suspected

Provided by: Drs. Jeff Stachler and Mike Christoffers
Areas and counties of ND and MN having known and suspected glyphosate-resistant weeds

- 5 to 95% all acres gly-R waterhemp
- 70 to 95% all acres gly-R C. Rag.
- 30 to 60% all acres gly-R C. Rag.
- 5 to 95% all acres gly-R G. Rag. & waterhemp

5 to 50% soybean fields gly-R C. Rag.
70 to 95% all acres have gly-R waterhemp
60 to 95% all acres have gly-R G. Rag.

Gly-R horseweed
Gly-R kochia
Gly-R common ragweed
Gly-R giant ragweed
Gly-R waterhemp

Provided by: Drs. Jeff Stachler and Mike Christoffers

Black symbols: confirmed resistant cases; Blue: highly suspected
Areas and counties of ND and MN having confirmed and suspected glyphosate-resistant weeds

32% of 37 2012 kochia samples confirmed R

15 to 90% soybean fields gly-R C. Rag.
5 to 95% all fields gly-R waterhemp
70 to 95% all fields gly-R C. Rag.
30 to 60% all fields gly-R C. Rag.
15 to 90% soybean fields gly-R C. Rag.

5 to 60% all fields have gly-R kochia
70 to 95% all fields have gly-R waterhemp
60 to 95% all fields have gly-R G. Rag.

Gly-R horseweed / marestail
Gly-R kochia
Gly-R common ragweed
Gly-R giant ragweed
Gly-R waterhemp

Black symbols: confirmed resistant cases; Blue: highly suspected

Provided by: Drs. Jeff Stachler, Jeff Gunsolus, Mike Christoffers, and Kirk Howatt
Managing Glyphosate to Maximize Performance

- Apply glyphosate at highest labeled rates to prevent weed escapes
Managing Glyphosate to Maximize Performance

• Know the surfactant load of the glyphosate product
  – Total NIS .5%-1% v/v
    • PowerMax = full surfactant load
    • Cornerstone = partial surfactant load

• Add proper amount of AMS
  – 8.5-17#/100 gal
Know Your Products!

- Class Act NG recommended rate of 2.5% v/v is equivalent to 8.5 lbs AMS/100 gal of solution.
- Flame recommended rate is 0.5% v/v is equivalent to 0.6 lbs AMS/100 gal of solution.
- Check adjuvant labels for recommended rate and equivalences. Again, water hardness plays a big part in proper adjuvant and rate for optimum weed control potential.
AMS with Glyphosate

• Hard Water
  – Contains cations (Na, Ca, Mg, Fe) that inactivate glyphosate
  – AMS displaces these cations to prevent glyphosate from becoming inactive

• AMS aids in the absorption of glyphosate into the plant
  – Increases weed control under adverse growing conditions
Know Your Products!

• Products that claim to replace AMS
  – Acidic AMS replacements generally made with denatured sulfuric acid
    • Lowers pH of spray solution (1.5-3pH) thus prevents salts from binding to glyphosate
  – Water Conditioning Agents (WCA)
    • Performance is inconsistent
    • Higher cost

• Straight AMS is cheap and it works!
Glyphosate + AMS + NIS = 65-72% broadleaf control
Bottom Line

• Simply put, AMS+NIS works!
• Company’s push new products exclusive to their own company
• Adjuvants and surfactants aren’t regulated by EPA – know your products!
Use Different Modes of Action In Rotational Crops

By Using:
Pre-Emerge/PPI Herbicides
Tank Mixing Herbicides w/Glyphosate
Keeping Small Grains in Rotation
Liberty Link Technology
On The Following Slides Herbicides Were Selected Based On:

- No Pursuit or Atrazine Present
- Labeled in Both ND and MN
- Short Rotation Restriction to Sugarbeets
- Effectiveness
- Spur Discussion with your Local Ag Suppliers
## Corn Pre & PPI Options

<table>
<thead>
<tr>
<th>Pre-Emerge Herbicides for RR Corn</th>
<th>Sugarbeet Rotation Restrictions</th>
<th>Common Ragweed</th>
<th>Giant Ragweed</th>
<th>Lambsquarters</th>
<th>Kochia</th>
<th>Waterhemp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verdict @ &gt; 10 fl oz/A</td>
<td>NCS</td>
<td>G/E</td>
<td>G</td>
<td>G/E</td>
<td>G/E</td>
<td>G/E</td>
</tr>
<tr>
<td>Harness / Surpass</td>
<td>NCS</td>
<td>F</td>
<td>P</td>
<td>F/G</td>
<td>F</td>
<td>G/E</td>
</tr>
<tr>
<td>Fierce (apply 7-14 days b4 planting)</td>
<td>18mth</td>
<td>F/G</td>
<td>N/P</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Callisto</td>
<td>18 mth</td>
<td>G/E</td>
<td>G</td>
<td>G/E</td>
<td>P</td>
<td>G/E</td>
</tr>
</tbody>
</table>

**Verdict**
- Product of Choice as a Pre/PPI
- Short Rotation Restriction to Sugarbeets
- Very Effective on Weeds that are High Risk for Resistance

**Harness/Surpass**
- 2nd most Popular
- Not enough activity on Ragweed & Kochia
Corn Post Tank Mix Options With Glyphosateate

<table>
<thead>
<tr>
<th>Post Tank Mixes with Glyphosate for RR Corn</th>
<th>Sugarbeet Rotation Restrictions</th>
<th>Common Ragweed</th>
<th>Giant Ragweed</th>
<th>Lambsquarters</th>
<th>Kochia</th>
<th>Waterhemp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>4 mth</td>
<td>G/E</td>
<td>G/E</td>
<td>G/E</td>
<td>E</td>
<td>G</td>
</tr>
<tr>
<td>Banvel /Clarity</td>
<td>NCS</td>
<td>G/E</td>
<td>G</td>
<td>G</td>
<td>G/E</td>
<td>G</td>
</tr>
<tr>
<td>Halex GT</td>
<td>18 mth</td>
<td>E</td>
<td>G</td>
<td>E</td>
<td>E</td>
<td>G/E</td>
</tr>
<tr>
<td>Impact/Armezon</td>
<td>18 mth</td>
<td>G</td>
<td>G</td>
<td>G/E</td>
<td>E</td>
<td>G/E</td>
</tr>
<tr>
<td>Laudis</td>
<td>18 mth see label</td>
<td>G</td>
<td>G</td>
<td>G/E</td>
<td>E</td>
<td>G/E</td>
</tr>
<tr>
<td>Callisto</td>
<td>18mth</td>
<td>F</td>
<td>G</td>
<td>G/E</td>
<td>P/F</td>
<td>E</td>
</tr>
</tbody>
</table>

**Status**
- Product of Choice as a Post Tank Mix partner with Glyphosateate
- Short Rotation Restrictions to Sugarbeets
- Very Effective on weeds that are high risk for resistance
Notes on Corn products

• Verdict is the product of choice for a Pre/PPI
  – Combination of Sharpen and Outlook

• Status cannot be applied by air
  – Makes a Pre-Emerge much more important
Soybean Pre & PPI Options

<table>
<thead>
<tr>
<th>Pre-Emerge Herbicides for RR Soybeans</th>
<th>Sugarbeet Rotation Restrictions</th>
<th>Common Ragweed</th>
<th>Giant Ragweed</th>
<th>Lambsquarters</th>
<th>Kochia</th>
<th>Waterhemp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valor</td>
<td>NCS</td>
<td>N/F</td>
<td>N/P</td>
<td>G/E</td>
<td>G/E</td>
<td>G/E</td>
</tr>
<tr>
<td>Verdict @ 5 fl oz/A</td>
<td>NCS</td>
<td>P/F</td>
<td>P</td>
<td>P/G</td>
<td>P/F</td>
<td>F/G</td>
</tr>
<tr>
<td>Outlook</td>
<td>NCS</td>
<td>P</td>
<td>P</td>
<td>P/F</td>
<td>N/P</td>
<td>F/G</td>
</tr>
<tr>
<td>Boundary (Sencor+Dual)</td>
<td>18 mth</td>
<td>G</td>
<td>P/F</td>
<td>G</td>
<td>P</td>
<td>G/E</td>
</tr>
</tbody>
</table>

Hard to find All-Round Weed Activity with Short Rotation Restriction to Sugarbeets

**Valor**
- Very Good on some of the weeds with a high risk for resistance

**Verdict**
- For Increased Activity: Mix Verdict @ 5 oz/Acre and Outlook @ 5 oz/Acre
## Soybean Post Tank Mix Options

With Glyphosate

<table>
<thead>
<tr>
<th>Post Tank Mixes with Glyphosate for RR Soybeans</th>
<th>Sugarbeet Rotation Restrictions</th>
<th>Common Ragweed</th>
<th>Giant Ragweed</th>
<th>Lambsquarters</th>
<th>Kochia</th>
<th>Waterhemp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexstar</td>
<td>18 mth</td>
<td>G/E</td>
<td>G</td>
<td>P/F</td>
<td>G</td>
<td>G/E</td>
</tr>
<tr>
<td>Cobra</td>
<td>NCS</td>
<td>G/E</td>
<td>G</td>
<td>P</td>
<td>P/F</td>
<td>G/E</td>
</tr>
</tbody>
</table>

Post Tank Mix options can cause Soybean injury like Bronzing of leaves. However, if you have a weed with resistance, it is better to control them than not at all.
Liberty Link Technology

- In soybeans and corn
- Some varieties now have a combination of both RR and LL Tolerance
- Provides new mode of action to cropping system
- Liberty needs ideal hot days and high rates and possible tank mixes for good control
- Minimum 15 gal/a ground and 10 gal/a air
Other Weed Problems

**Starane Resistant Kochia**
- Industry is using Huskie as the solution
- Has 9 month rotation restriction to sugarbeets
Work With Ag Suppliers

• Work with your local Ag Supplier to help you develop a plan for Roundup Resistance Management in your rotational crops
• Many have been talking with their customers already
Resistant Waterhemp Management in Sugarbeet

• **1st Post-cotyledon sugarbeets**
  – RoundUp (28 to 32 oz/a) + Betamix (12 oz/a) + Ethofumesate (4 oz/a) + HSMOC (1.5 pt/a) + AMS (1.5#/a)
    • If resistant ragweed is present add Stinger (1.3 oz/a)

• **2nd Post-10 to 14 DAT**
  – RoundUp (24 to 28 oz/a) + Betamix (16 oz/a if 4 lf sgbt) + Ethofumesate (4 oz/a) + Outlook (14 to 21 oz/a) or Dual (1.5pt/a) + HSMOC (1 pt/a) + AMS (1.5#/a)
    • If resistant ragweed is present add Stinger (1.3 oz/a)
Resistant Waterhemp Management in Sugarbeet

• 3\textsuperscript{rd} Post-8 leaf sugarbeet
  – RoundUp (22 oz/a) + Betamix (24 oz/a) + Ethofumesate (4 oz/a) + Outlook (0 to 10 oz/a) or Dual (0 to 1 pt/a) + HSMOC (1 pt/a) + AMS (1.5#/a)
    • If resistant ragweed is present add Stinger (1.3 to 2 oz/a)
    • 90 day PHI for Ethofumesate

• 4\textsuperscript{th} Post-10 to 21 DAT (If needed)
  – RoundUp (22 oz/a) + Betamix (32 to 48 oz/a) + AMS (1.5#/a)
    • 75 day PHI for Betamix
Resistant Kochia Management in Sugarbeet

- Apply Ethofumesate (6 to 7.5 pt/a) Pre or PPI
- 1\textsuperscript{st} Post-1 leaf kochia
  - RoundUp (28 to 32 oz/a) + Betamix (12 oz/a) + Ethofumesate (4 oz/a) + HSMOC (1.5 pt/a) + AMS (1.5#/a)
    - If resistant ragweed is present add Stinger (1.3 oz/a)
- 2\textsuperscript{nd} Post-10 to 14 DAT, 1 leaf kochia
  - RoundUp (24 to 28 oz/a) + Betamix (16 oz/a if 4 lf sgbt) + Ethofumesate (4 oz/a) + HSMOC (1 pt/a) + AMS (1.5#/a)
    - If resistant ragweed is present add Stinger (1.3 oz/a)
Resistant Kochia Management in Sugarbeet

• 3rd Post-8 leaf sugarbeets
  – RoundUp (22 oz/a) + Betamix (24 oz/a) + Ethofumesate (4 oz/a) + HSMOC (1 pt/a) + AMS (1.5#/a)
    • If resistant ragweed is present add Stinger (1.3 to 2 oz/a)
    • 90 day PHI for Ethofumesate

• 4th Post-10 to 21 DAT (If needed)
  – RoundUp (22 oz/a) + Betamix (32 to 48 oz/a) + AMS (1.5#/a)
    • 75 day PHI for Betamix
Resistant Ragweed Management in Sugarbeet

• 1<sup>st</sup> Post-cotyledon sugarbeets
  – RoundUp (28 to 32 oz/a) + Stinger (1.3 to 4 oz/a) + AMS (1.5#/a)

• 2nd Post-10 to 14 DAT
  – RoundUp (24 to 28 oz/a) + Stinger (1.3 to 4 oz/a) + AMS (1.5#/a)

• 3rd Post-8 leaf sugarbeet
  – RoundUp (22 oz/a) + Stinger (1.3 to 4 oz/a) + AMS (1.5#/a)

• 4th Post-10 to 21 DAT (If needed same as 3<sup>rd</sup>)
  – 45 day PHI for Stinger
  – Do not exceed 10.7 oz/a per season
ACSC Chemical

• All retailer/distributors have availability to ACSC chemical
  – Sugarbeet Mix (Generic Betamix)
  – Phen-Des 8+8 (Generic Betamix)
  – B & B Plus (Generic Progress)
• Stored at AgDepot in Grand Forks
• No Deliveries
• Full Pallet Only (180 gals)
• No Returns
What week do you think the bulk of the acres will be planted?

A. 2\textsuperscript{nd} week of April
B. 3\textsuperscript{rd} week of April
C. 4\textsuperscript{th} week of April
D. 1\textsuperscript{st} week of May
E. 2\textsuperscript{nd} week of May
F. 3\textsuperscript{rd} week of May
Any Questions?