Weed Resistant 2014
Weed Resistant Statistics

• 1st resistance in 1970 in Washington to Triazine chemistry
• 143 different weed species resistant in U.S. (Beyond the Bean Feb. ‘14)
• 65 million acres are effected by resistant weeds in U.S. (Farm Journal Feb. ‘14)
• As much as 80% of Soybeans and cotton was weeded in Arkansas in 2012 (Midwest Producer July ‘12)
  – Some fields disked under!
Glyphosate

• Introduced in mid 1970’s
• Primarily used as a burn down
• Introduction of RR soybeans in 1996
• RR Corn 1998
• RR Sugarbeets 2008
• Controls the widest spectrum of weeds in cropping season
• Most widely used herbicide today
Understanding Resistance

• Tolerance
  – Yellow nutsedge and wild buckwheat are 2 examples of naturally tolerant to glyphosate
  – Labeled rates of glyphosate are less effective

• Nonperformance
  – Incorrect rate for weed size
  – Rain before completely absorbed
  – Incomplete spray coverage below canopy
  – Reduced glyphosate activity from low temperatures
  – Dust from sprayer
  – Proper adjuvant and AMS rate
Understanding Resistance

Identifying the stages of glyphosate resistant waterhemp in a field

- Dead
- No Injury Resistant
- Slight Injury
- Seriously Injured
- Moderate Injury
2013 Weed Resistance Map
2013 Weed Resistance Map
North Dakota Herbicide Chart

Repeated use of herbicides with the same site of action alone can result in the development of herbicide-resistant weed populations.

By Mode of Action (effect on plant growth)

This chart groups herbicides by their modes of action to assist you in selecting 1) to maintain greater diversity in herbicide use and 2) to rotate among herbicides with different sites of action to delay the development of herbicide resistance.

The Site of Action Group is a classification system developed by the Weed Science Society of America.
## RR Corn Options

<table>
<thead>
<tr>
<th>Pre-Emerge Herbicides for RR Corn</th>
<th>Site of Action</th>
<th>Formulation</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>14,15</td>
<td>EC</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>15</td>
<td>EC</td>
<td>NCS</td>
<td>F</td>
<td>P</td>
<td>F/G</td>
<td>F</td>
<td>G/E</td>
</tr>
<tr>
<td>Callisto</td>
<td>27</td>
<td>SC</td>
<td>18 mth</td>
<td>G/E</td>
<td>G</td>
<td>G/E</td>
<td>P</td>
<td>G/E</td>
</tr>
<tr>
<td>Zidua</td>
<td>15</td>
<td>WDG</td>
<td>15 mth</td>
<td>P/F</td>
<td>P</td>
<td>F</td>
<td>F/G</td>
<td>G/E</td>
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</tbody>
</table>

### Post Tank Mixes with Glyphosate for RR Corn

<table>
<thead>
<tr>
<th>Status</th>
<th>Site of Action</th>
<th>Formulation</th>
<th>Sugarbeet Rotation Restrictions</th>
<th>Common Ragweed</th>
<th>Giant Ragweed</th>
<th>Lambsquarters</th>
<th>Kochia</th>
<th>Waterhemp</th>
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<tbody>
<tr>
<td>Status</td>
<td>4,19</td>
<td>WDG</td>
<td>4 mth</td>
<td>G/E</td>
<td>G/E</td>
<td>G/E</td>
<td>E</td>
<td>G</td>
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<tr>
<td>Banvel / Clarity</td>
<td>4</td>
<td>SL</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>9,15,27</td>
<td>SC</td>
<td>18 mth</td>
<td>G</td>
<td>G</td>
<td>G/E</td>
<td>G/E</td>
<td>G/E</td>
</tr>
<tr>
<td>Impact</td>
<td>27</td>
<td>SC</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>27</td>
<td>SC</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>27</td>
<td>SC</td>
<td>18 mth</td>
<td>F</td>
<td>G</td>
<td>G/E</td>
<td>P/F</td>
<td>E</td>
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</tbody>
</table>
## RR Soybean Options

<table>
<thead>
<tr>
<th>Pre-Emerge Herbicides for RR Soybeans</th>
<th>Site of Action</th>
<th>Formulation</th>
<th>Sugarbeet Rotation Restrictions</th>
<th>Common Ragweed</th>
<th>Giant Ragweed</th>
<th>Lambsquarters</th>
<th>Kochia</th>
<th>Waterhemp</th>
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</thead>
<tbody>
<tr>
<td>Valor</td>
<td>14</td>
<td>WDG</td>
<td>4-10 mth</td>
<td>N/F</td>
<td>N/P</td>
<td>G/E</td>
<td>G/E</td>
<td>G/E</td>
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<tr>
<td>Verdict @ 5 fl oz/A</td>
<td>14,15</td>
<td>EC</td>
<td>NCS</td>
<td>P/F</td>
<td>P</td>
<td>P/G</td>
<td>P/F</td>
<td>F/G</td>
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<tr>
<td>Outlook</td>
<td>15</td>
<td>EC</td>
<td>NCS</td>
<td>P</td>
<td>P</td>
<td>N/P</td>
<td>F/G</td>
<td>G/E</td>
</tr>
<tr>
<td>Boundary (Sencor+Dual)</td>
<td>5,15</td>
<td>EC</td>
<td>18 mth</td>
<td>G</td>
<td>P/F</td>
<td>G</td>
<td>P</td>
<td>G/E</td>
</tr>
<tr>
<td>Zidua</td>
<td>15</td>
<td>WDG</td>
<td>15 mth</td>
<td>P/F</td>
<td>P</td>
<td>F</td>
<td>F/G</td>
<td>G/E</td>
</tr>
<tr>
<td>Fierce</td>
<td>14,15</td>
<td>WDG</td>
<td>18 mth</td>
<td>P/F</td>
<td>P</td>
<td>F/G</td>
<td>G/E</td>
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</tr>
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### Post Tank Mixes with Glyphosate for RR Soybeans

<table>
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<tr>
<th>Herbicide</th>
<th>Site of Action</th>
<th>Formulation</th>
<th>Sugarbeet Rotation Restrictions</th>
<th>Common Ragweed</th>
<th>Giant Ragweed</th>
<th>Lambsquarters</th>
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<tbody>
<tr>
<td>Flexstar</td>
<td>14</td>
<td>EC</td>
<td>18 mth</td>
<td>G/E</td>
<td>G</td>
<td>P/F</td>
<td>G</td>
<td>G/E</td>
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<tr>
<td>Cobra</td>
<td>14</td>
<td>EC</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>

NCS = Next Cropping Season  2CS = Two Cropping Seasons
N = None  P = Poor  F = Fair  G = Good  E = Excellent
EC = Emulsifiable Concentrate; SC = Suspension Concentrate; SL = Soluble Liquid; WDG = Water Dispersible Granule
Waterhemp Resistance

- Resistant to multiple Site of Action
  - Site 2 ALS Inhibitors (Harmony, Raptor)
  - Site 4 Growth Regulators (Clarity)
  - Site 5 Photosystem II Inhibitors (Atrazine)
  - Site 9 EPSP Synthase Inhibitors (Glyphosate)
  - Site 14 PPO Inhibitors (Flexstar)
  - Site 27 HPPD Inhibitors (Huskie)
Resistant Waterhemp Management in Sugarbeet

- PPI/PRE Nortron (8) (2 to 5 pt/a) + Dual (15) (.5 to 1 pt/a) or Nortron (8) (6 to 7.5 pt/a)
  - Need to sign an Indemnified Label for PPI/PRE Dual
- 1\textsuperscript{st} Post-cotyledon sugarbeets
  - Roundup (9) (28 to 32 oz/a) + Betamix (5) (12 oz/a) + Nortron (8) (4 oz/a) + HSMOC (1 pt/a) + AMS (1#/a)
- 2\textsuperscript{nd} Post-10 to 14 DAT
  - Roundup (9) (24 to 28 oz/a) + Betamix (5) (16 oz/a if 4 lf sgbt) + Nortron (8) (4 oz/a) + Outlook (15) (14 to 21 oz/a) or Dual (15) (1 pt/a) + HSMOC (1 pt/a) + AMS (1#/a)
Resistant Waterhemp Management in Sugarbeet

• 3<sup>rd</sup> Post-8 leaf sugarbeet
  – Roundup (22 oz/a) + Betamix (24 oz/a) + Nortron (4 oz/a) + Outlook (0 to 10 oz/a) or Dual (0 to 1 pt/a) + HSMOC (1 pt/a) + AMS (1 #/a)
    • 90 day PHI for Nortron & max annual use 1 gal/a

• 4<sup>th</sup> Post-10 to 21 DAT (If needed)
  – Roundup (22 oz/a) + Betamix (32 to 48 oz/a) + AMS (1 #/a)
    • 75 day PHI for Betamix
Kochia Resistance

• Resistant to multiple Site of Action
  – Site 2 ALS Inhibitors (Harmony, Raptor)
  – Site 4 Growth Regulators (Clarity)
  – Site 5 Photosystem II Inhibitors (Atrazine)
  – Site 9 EPSP Synthase Inhibitors (Glyphosate)
Resistant Kochia Management in Sugarbeet

• PPI/PRE Nortron (6 to 7.5 pt/a)

• 1\textsuperscript{st} Post-1 leaf kochia
  – Roundup (28 to 32 oz/a) + Betamix (12 oz/a) + Nortron (4 oz/a) + HSMOC (1 pt/a) + AMS (1 #/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) + Nortron (4 oz/a) + HSMOC (1 pt/a) + AMS (1 #/a)
Resistant Kochia Management in Sugarbeet

• 3rd Post-8 leaf sugarbeets
  – Roundup (22 oz/a) + Betamix (24 oz/a) + Nortron (4 oz/a) + HSMOC (1 pt/a) + AMS (1 #/a)
    • 90 day PHI for Nortron & max annual use 1 gal/a

• 4th Post-10 to 21 DAT (If needed)
  – Roundup (22 oz/a) + Betamix (32 to 48 oz/a) + AMS (1 #/a)
    • 75 day PHI for Betamix
Common Ragweed Resistance

• Resistant to multiple Site of Action
  – Site 2 ALS Inhibitors (Harmony, Raptor)
  – Site 5 Photosystem II Inhibitors (Atrazine)
  – Site 9 EPSP Synthase Inhibitors (Glyphosate)
  – Site 14 PPO Inhibitors (Flexstar)
Resistant Ragweed Management in Sugarbeet

- **1\(^{st}\) Post-cotyledon sugarbeets**
  - Roundup (28 to 32 oz/a) + Stinger (3 to 4 oz/a) + AMS (1 #/a)

- **2nd Post**-10 to 14 DAT
  - Roundup (24 to 28 oz/a) + Stinger (3 to 4 oz/a) + AMS (1 #/a)

- **3rd Post**-8 leaf sugarbeet
  - Roundup (22 oz/a) + Stinger (3 to 4 oz/a) + AMS (1 #/a)

- **4th Post**-10 to 21 DAT (If needed same as 3\(^{rd}\))
  - 45 day PHI for Stinger
  - Do not exceed 10.7 oz/a per season
Keys to Resistant Weed Control

• Use a PPI/PRE
• Spray small weeds (1”)
• Use maximum glyphosate rates allowed
• Tank mix
• Manage sprays around weather/environment
• Scout fields 7-10 days after application
• Hand weed when necessary
Keys to Resistant Weed Control

- More chemistry class choices in rotational crops, use them
- Perimeter weed management
- Row crop cultivation only when needed
- Moldboard plow to bury weed seeds
- Do not allow weed seed production!
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
Any Questions?