2019 Weed Control Update

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Axial Bold

- Axial XL + Puma
- Full rate of Axial + reduced rate of Puma
- 15 fl oz product (16.4 fl oz Axial + 0.21 pt Puma)

- Wheat and barley, not for durum
- Wheat: Emergence to pre-boot
- Barley: Emergence to prior to jointing
Authority Supreme

- Spartan + Zidua
- Soybean, sunflower, dry pea, chickpea

<table>
<thead>
<tr>
<th>Authority Supreme</th>
<th>Spartan</th>
<th>Zidua</th>
</tr>
</thead>
<tbody>
<tr>
<td>(fl oz)</td>
<td>(fl oz)</td>
<td>(oz)</td>
</tr>
<tr>
<td>5</td>
<td>2.6</td>
<td>1.5</td>
</tr>
<tr>
<td>7.7</td>
<td>4</td>
<td>2.35</td>
</tr>
</tbody>
</table>
Spring dandelion control with Glyphosate and Group 14 herbicides
Fall dandelion control with Glyphosate and Group 14 herbicides
Kochia control with fall–applied herbicides (2007)

- UNT
- Gly + Lin
- Gly + K12
- Gly + Valor 2
- Valor 3
- Gly + BS
- Gly + 2,4-D + dic
- Gly + BS + dic
- Gly + EXP 1
- Gly + EXP 2

Carpio 2007
Table. Fall vs. spring applications for control of emerged glyphosate-resistant kochia.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate</th>
<th>Timing</th>
<th>Kochia control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Fierce</td>
<td>3 oz</td>
<td>Fall</td>
<td>90</td>
</tr>
<tr>
<td>Valor</td>
<td>3 oz</td>
<td>Fall</td>
<td>91</td>
</tr>
<tr>
<td>Metribuzin</td>
<td>0.5 lb</td>
<td>Fall</td>
<td>30</td>
</tr>
<tr>
<td>Spartan</td>
<td>5 fl oz</td>
<td>Fall</td>
<td>55</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>22 fl oz</td>
<td>Spring</td>
<td>50</td>
</tr>
<tr>
<td>Gramoxone + Metribuzin + NIS</td>
<td>2 pt + 0.5 lb + 0.25%</td>
<td>Spring</td>
<td>99</td>
</tr>
<tr>
<td>Authority MTZ</td>
<td>12 oz</td>
<td>Spring</td>
<td>68</td>
</tr>
<tr>
<td>Fierce + Metribuzin</td>
<td>3 oz + 0.5 lb</td>
<td>Spring</td>
<td>80</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td></td>
<td></td>
<td>5.4</td>
</tr>
</tbody>
</table>

*a* All treatments applied with Glyphosate + AMS (22 oz + 2.5 gal/100 gal); Glyphosate = 4.5 lb ae formulation

*b* Applied Oct 8, 2014 (kochia 8-12 inches) and May 21, 2015 (kochia 0.5-4 inches)
June 10

Valor 3 oz +
Roundup 22 oz +
2,4-D ester 1 pt

Untreated
Kochia
Valor + Metribuzin + 2,4-D
4 oz + 4 oz + 12 oz
Applied Nov 16, 2016
Picture June 5, 2017

Photo: Tom Gardner, Valent
Horseweed
Valor 3 oz +
PowerMax +
2,4-D/dicamba
Fall-applied
Kochia regrowth following Starane Ultra application
Foxtail barley control

Glyphosate 32 oz
Fall-applied

Glyphosate 32 oz + Metribuzin 0.33 lb
Fall-applied
Foxtail barley control

Glyphosate 32 oz Fall-applied

Glyphosate 32 oz + Metribuzin 0.33 lb Fall-applied
Foxtail barley control

Untreated

Glyphosate 32 oz + Metribuzin 0.33 lb
Fall-applied
## Wild oat resistance test

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Field 1</th>
<th>Field 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puma</td>
<td>MR</td>
<td>R</td>
</tr>
<tr>
<td>Axial XL</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Assure II</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Select</td>
<td>S</td>
<td>MR</td>
</tr>
<tr>
<td>Everest</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>GoldSky</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Huskie Complete</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Raptor</td>
<td>R</td>
<td>R</td>
</tr>
</tbody>
</table>

S = Susceptible
SR = Slightly Resistant
MR = Moderately Resistant
R = Resistant
## Recent wild oat and green foxtail resistance testing

<table>
<thead>
<tr>
<th>Wild oat (27 samples)</th>
<th>Green foxtail (16 samples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puma: 23</td>
<td>Puma: 14</td>
</tr>
<tr>
<td>Axial: 14</td>
<td>Axial: 10</td>
</tr>
<tr>
<td>Assure II: 21</td>
<td>Assure II: 11</td>
</tr>
<tr>
<td>Select: 0</td>
<td>Select: 1</td>
</tr>
<tr>
<td>Everest: 26</td>
<td>Everest: 2</td>
</tr>
<tr>
<td>GoldSky: 27</td>
<td>GoldSky: 2</td>
</tr>
<tr>
<td>Varro: 27</td>
<td>Varro: 2</td>
</tr>
<tr>
<td>Raptor: 12</td>
<td>Raptor: 0</td>
</tr>
</tbody>
</table>
Palmer amaranth:
It’s now in ND, but why should we care?
What makes Palmer amaranth a “Game Changer”?

- Grows aggressively: Can grow 2 to 3 inches per day in optimum conditions
- Can grow to 6-8 feet tall
- Has reduced yield up to 91 percent in corn and 79 percent in soybean
- Prolific seed producer: Up to 1 million seeds per plant
- Emerges throughout the growing season
- Very prone to herbicide resistance (multiple modes of action)
Palmer Amaranth
10 Days After Planting

Preemergence

Untreated
Palmer Amaranth
14 Days after planting

Preemergence

Untreated
Palmer Amaranth
20 Days After Planting

Preemergence  Untreated
The Difference of 2 Days!

Flexstar on 6" Palmer

Flexstar on 3" Palmer

Photo courtesy
Dr. Larry Steckel
Soybean planted into weed-free soil May 16

Photograph taken May 29

Photograph courtesy Dr. Larry Steckel
Soybean planted into weed-free soil May 16

Photograph taken May 29

Photograph courtesy Dr. Larry Steckel
5 Counties in ND

- Combine from Midwest
- Custom combines
- Railroad car
- Sunflower screenings
- Millet seed?
Palmer amaranth identification

- Smooth stem
- Symmetrical leaf arrangement
- May have spike on leaf tip
- Long leaf petiole
- Female plant spiny bracts
- Poinsettia-like appearance
Palmer amaranth and Waterhemp

- Need good crop competition
- PREs are a must
- Multiple modes of action
- Layered applications
- Don’t let anything go to seed
Labor – hand-weed

2010 – 110 hrs
2011 – 5 hrs
2012 – 2 hrs
Goal = Prevent Seed Production

Layered Residuals for Late-Emerging Weeds

Prevent Seed Production

~30 DAP

Herbicide Concentration

May 1  June 1  July 1  August 1

Effective Concentration for Control

Common Ragweed  Lambsquarters  Waterhemp

PRE Layered Residual

Slide courtesy of Jared Goplen, Univ of MN
PRE only application of Outlook

Layered PRE/POST applications of Outlook (May 5 and June 8)
Waterhemp control over time with residual and layered residual herbicide

- Layered application made ~30 days after planting
- Waterhemp Emergence

- Waterhemp control (%)
- Days after planting
- 24 days, 41 days, 57 days, 69 days

- Layered
- PRE only

Slide courtesy of Jared Goplen, Univ of MN
Missouri Weeds: Waterhemp Confirmed with 6-Way Resistance

FROM THE WEED SCIENCE SOCIETY OF AMERICA

A study featured in the journal Weed Science is certain to keep many corn and soybean growers up at night. Researchers have identified a waterhemp population in Missouri that is resistant to a record-breaking six herbicide mechanisms of action.

It all started when growers in Randolph County, Missouri, reported a population of waterhemp that appeared to be resistant to 2,4-D. Researchers from the University of Missouri conducted field experiments to confirm their findings.
PALMER AMARANTH

Palmer Amaranth

Identification

Palmer Amaranth

Latest Update

The #1 weed problem in the country is not in North Dakota... Yet.

We need to keep it that way. Palmer amaranth is a type of pigweed that has devastated crops in the South and Midwest. It has now been identified in South Dakota, Iowa and Minnesota. We need to establish a zero tolerance for this weed.

MORE NEWS

Potential Impact

"Palmer amaranth's prolonged emergence period, rapid growth rate, prolific seed production, and propensity to develop herbicide resistance quickly makes this the most persistent, elusive, and serious weed threat that North Dakota farmers have ever faced." - Rich Ziegler, North Dakota State University Weed Scientist

Palmer amaranth is a competitive and aggressive pigweed species that poses a major threat to North Dakota crop production. Here's why:

- Grows aggressively: Can grow 2 to 3 inches per day in optimal conditions
- Can grow to 6 feet tall
- Has reduced yield up to 51 percent in corn and 75 percent in soybeans
- Prolific seed production: Up to 1 million seeds per plant
- Emerges throughout the growing season
- Very persistent; herbicide resistance (multiple modes of action)

"The only weed I’ve seen that can drive a farmer out of business." - Bill Jenkins, Purdue University Extension Weed Specialist

Identification