2020/2021 Weed Control Research in Winter Wheat

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Strategies to manage horseweed (marestail) in winter wheat – Year 1 (20-08-07-AS)

Horseweed issues

• Problem in all aspects of the crop rotation
• Prolonged emergence
• Prolific seed production
• Long distance seed dispersal
• Herbicide-resistance issues
  • Glyphosate (Group 9)
  • ALS-inhibitors (Group 2)

High number of seeds produced (200,000 seeds/plant)

Small windblown seed (Reports of 125 plants/yd^2, 400 ft from source)
Horseweed is a problem in all aspect of the wheat growing season

- At planting
- Throughout the season
- After harvest
Research objectives

(FY20-21)

1. Evaluate the effects of tillage and fall herbicide treatments on horseweed control in winter wheat.

2. Determine which commonly used broadleaf herbicide in winter wheat herbicides provides the best horseweed control.

3. Determine the effects that horseweed competition has on winter wheat yield.

4. Evaluate management strategies for horseweed after winter wheat harvest.

5. Provide management recommendations for horseweed management to Michigan wheat growers.
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*(FY20-21)*

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Horseweed control in winter wheat

‘Whale’ soft red wheat
Planted: Oct. 20, 2020
1.8 million seeds/A
Weed management systems examined (19 trts)

Table 1. Tillage and fall herbicide application main plots.

<table>
<thead>
<tr>
<th>Tillage treatments</th>
<th>Herbicide treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Conventional tillage</td>
<td>Spring herbicide treatments in Table 2</td>
</tr>
<tr>
<td>2 No-tillage</td>
<td>No fall applications fb. Spring treatments in Table 2</td>
</tr>
<tr>
<td>3</td>
<td>Sharpen at 1 fl oz(^1) (Fall) fb. Spring treatments in Table 2</td>
</tr>
<tr>
<td>4</td>
<td>Sharpen at 2 fl oz(^1) (Fall) fb. no spring treatment</td>
</tr>
</tbody>
</table>

Table 2. Spring herbicide treatments applied in each tillage and fall herbicide block.

<table>
<thead>
<tr>
<th>Herbicide treatment</th>
<th>SOA(^2) Group #</th>
<th>Rate</th>
<th>Additives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Huskie</td>
<td>6 + 27</td>
<td>15 fl oz/A</td>
<td>NIS + AMS</td>
</tr>
<tr>
<td>2 Talinor</td>
<td>6 + 27</td>
<td>18.2 fl oz/A</td>
<td>CoAct+</td>
</tr>
<tr>
<td>3 Quelex</td>
<td>2 + 4</td>
<td>0.75 oz/A</td>
<td>COC</td>
</tr>
<tr>
<td>4 Curtail</td>
<td>4 + 4</td>
<td>2 pt/A</td>
<td></td>
</tr>
<tr>
<td>5 MCPA</td>
<td>4</td>
<td>0.38 pt/A</td>
<td></td>
</tr>
<tr>
<td>6 Untreated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Roundup PowerMax (32 fl oz) + AMS will be included.
\(^2\) Herbicide site of action group numbers.
Horseweed control in winter wheat

Fall herbicide application:
Oct. 20, 2020
Prior to planting

Spring herbicide application:
May 5, 2021
Wheat stage: Feekes 5
Wheat ht.: 13-inches
Results

• Due to early dry conditions the wheat effectively competed with horseweed and other weeds.

• Injury was less than 5% with all herbicide applications throughout the season.

• Wheat yield was collected to compare tillage and herbicide applications.
Tillage and herbicide effects on wheat yield

Yield (bu/A)

Conventional tillage

- Huskie
- Talinor
- Quelex
- Curtail
- MCPA

- Untreated

No-till + Fall burndown

- Huskie
- Talinor
- Quelex
- Curtail
- MCPA

- Untreated

No-tillage

- Huskie
- Talinor
- Quelex
- Curtail
- MCPA

- Untreated

Legend:

- b
- a
- ab

Note: Lowercase letters indicate significant differences.
Main effects of tillage on winter wheat yield

Fall burndown applications are important for no-till wheat
Research objectives (FY20-21)

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Post-harvest strategies for horseweed control

POST herbicide application:
August 9 (~21 d after harvest)
Ave. horseweed ht.: 15-inches
Ave. c. ragweed ht.: 12-inches
## Herbicides evaluated

<table>
<thead>
<tr>
<th>Herbicides(^1)</th>
<th>SOA(^2) Group #</th>
<th>Rate</th>
<th>Additives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Roundup PowerMax 3</td>
<td>9</td>
<td>30 fl oz/A</td>
<td>AMS</td>
</tr>
<tr>
<td>2 Liberty</td>
<td>10</td>
<td>32 &amp; 43 fl oz/A</td>
<td>AMS</td>
</tr>
<tr>
<td>3 Gramoxone SL</td>
<td>22</td>
<td>2.7 pt/A</td>
<td>NIS</td>
</tr>
<tr>
<td>4 Enlist One (2,4-D)(^3)</td>
<td>4</td>
<td>1 pt/A &amp; 1 qt/A</td>
<td></td>
</tr>
<tr>
<td>5 XtendiMax (dicamba)(^3)</td>
<td>4</td>
<td>22 fl oz/A</td>
<td>VaporGrip + Intact</td>
</tr>
<tr>
<td>6 Sharpen(^3)</td>
<td>14</td>
<td>1 &amp; 2 fl oz/A</td>
<td>MSO</td>
</tr>
<tr>
<td>7 2,4-D ester + atrazine(^3)</td>
<td>4 + 5</td>
<td>1 pt/A + 1 qt/A</td>
<td>COC</td>
</tr>
<tr>
<td>8 Untreated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. 16 treatments with various combinations
2. Herbicide site of action group numbers.
3. Roundup PowerMax (32 fl oz) + AMS will be included.
Horseweed control – (14 DAT)

<table>
<thead>
<tr>
<th>Product</th>
<th>Control (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundup PowerMax 3</td>
<td>a</td>
</tr>
<tr>
<td>Liberty</td>
<td>b</td>
</tr>
<tr>
<td>Gramoxone</td>
<td>b</td>
</tr>
<tr>
<td>Enlist One + RUP</td>
<td>e</td>
</tr>
<tr>
<td>XtendiMax + RUP</td>
<td>d</td>
</tr>
<tr>
<td>Sharpen + RUP</td>
<td>c</td>
</tr>
<tr>
<td>2,4-D + Atrazine + RUP</td>
<td>a</td>
</tr>
<tr>
<td>2,4-D + Atrazine + RUP</td>
<td>a</td>
</tr>
</tbody>
</table>

1Rates in fl oz/A
Horseweed control with Liberty tank-mixes\(^1\) – (14 DAT)

![Bar chart showing horseweed control with Liberty tank-mixes](chart.png)

- **Liberty**: (32)\(^2\)
- **RUP + Lib**: (43)
- **Enlist One + Lib**: a
- **XtendiMax + Lib**: a
- **Sharpen (1) + Lib**: a
- **Sharpen (1) + Lib + RUP**: a

\(^1\)Tank-mix partners use lower rates
\(^2\)Rates in (x) fl oz/A
Common ragweed control – (14 DAT)

Liberty + Roundup or Liberty + XtendiMax **up** ragweed control

Liberty + Sharpen **down** ragweed control

Control (%)

<table>
<thead>
<tr>
<th>Control (%)</th>
<th>Roundup PowerMax 3</th>
<th>Liberty</th>
<th>Gramoxone</th>
<th>Enlist One + RUP</th>
<th>XtendiMax + RUP</th>
<th>Sharpen + RUP</th>
<th>2,4-D + Atrazine</th>
</tr>
</thead>
<tbody>
<tr>
<td>(32)</td>
<td>(32)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>(43)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1Rates in fl oz/A
We will continue to evaluate these plots for a few more weeks.
Plans for 2021/2022

• We would like to repeat these objectives and research for an additional year

• One change, experiment 1 will focus on the no-tillage treatments, so we will have the ability to be more flexible in finding a suitable field

• Create factsheets that provide these recommendations to wheat growers
Impacts

• Develop recommendations on the most effective horseweed management strategies in wheat and after wheat harvest.

• Proper management of horseweed will improve wheat yields where this weed is present, ultimately increasing economic returns and wheat quality.

• Resulting data will be added to the MSU Weed Control Guide for Field Crops (E-434) and presented in fact sheets, at extension meetings, and at www.MSUweeds.com
Winter wheat herbicide effects on cover crop establishment – Year 1 (20-08-06-AS)

Cover crops

• Potential benefits:
  • Improve soil health
  • Increase soil O.M., tilth, water holding capacity
  • Improve soil fertility
  • Decrease soil erosion
  • Reduce disease & insect pressure
  • Suppress weeds

• Issues:
  • Time for establishment and growth

PI’s: Christy Sprague and Dean Baas
Options for integrating cover crops in the wheat portion of the crop rotation

- Frost seeding
- Planting cover crops after wheat harvest
Challenge: cover crop establishment after herbicides have been applied

Huskie
Previous work on wheat herbicides that can be used if frost seeding red clover

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Rate</th>
<th>SOA#</th>
<th>FALL</th>
<th>SPRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affinity BroadSpec</td>
<td>0.75 oz</td>
<td>2</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Huskie</td>
<td>13.5 fl oz</td>
<td>27</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Osprey</td>
<td>4.75 oz</td>
<td>2</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td>PowerFlex HL</td>
<td>2 oz</td>
<td>2</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td>Clarity</td>
<td>0.25 pt</td>
<td>4</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>2,4-D ester*</td>
<td>1 pt</td>
<td>4</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>MCPA</td>
<td>0.38 pt</td>
<td>4</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Quelex</td>
<td>0.75 oz</td>
<td>2</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Axial XL</td>
<td>16.4 fl oz</td>
<td>1</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

* Not registered in Fall due to wheat yield losses

Y = Yes, C = Caution, N = No
Issues with herbicides and frost seeding red clover

- Limited spring applied herbicides can be used
- Late wheat planting limits opportunities for fall herbicide applications
- Newer weed problems may require spring herbicide applications
After wheat harvest provides opportunities for planting cover crops

**Question:** What cover crops can I plant after wheat harvest if I apply X herbicide?
Research on cover crop tolerance

Evaluate the effects of wheat herbicides on cover crop establishment and growth following winter wheat harvest.

<table>
<thead>
<tr>
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</thead>
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<tr>
<td>1  Huskie</td>
<td>15 fl oz/A</td>
</tr>
<tr>
<td>2  Talinor</td>
<td>18.2 fl oz/A</td>
</tr>
<tr>
<td>3  Affinity BroadSpec</td>
<td>1 oz/A</td>
</tr>
<tr>
<td>4  Quelex</td>
<td>0.75 oz/A</td>
</tr>
<tr>
<td>5  Osprey Xtra</td>
<td>4.75 oz/A</td>
</tr>
<tr>
<td>6  PowerFlex HL</td>
<td>2 oz/A</td>
</tr>
<tr>
<td>7  Axial Bold</td>
<td>15 fl oz/A</td>
</tr>
<tr>
<td>8  Stinger</td>
<td>0.33 pt/A</td>
</tr>
<tr>
<td>9  Untreated</td>
<td></td>
</tr>
</tbody>
</table>

Received matching funds from Project GREEEN for an additional location.
Herbicide applications

SVREC:
Sprayed: April 7

KBS:
Sprayed: April 16

Campus:
Sprayed: April 26
Herbicides did not cause wheat injury

- SVREC or KBS
Certain herbicides injured wheat at MSU
Herbicide injury on wheat

*MSU*
The ALS-inhibiting (Group 2) herbicides caused the most injury – (14 DAT)
What caused herbicide injury at MSU?
Cold temperatures at herbicide application impacted herbicide injury to wheat.

SVREC

KBS

Campus
Injury due to cold temperatures at application resulted in yield loss from Osprey Xtra and PowerFlex HL.
Cold temperatures at herbicide application

*Can increase herbicide injury to wheat*

- Herbicide applications should be made when *weeds are actively growing*
- **DO NOT** apply when crop is under stress from:
  - Cold temperatures
  - Wide fluctuations in day/night temperatures
  - Frost
  - Temperatures below freezing prior to/at/immediately following the application
- **Rule of thumb:**
  - Only apply herbicides to winter wheat when daily temperature is 50°F or higher.
Nine different cover crops were seeded after harvest:

- Annual ryegrass
- Cereal rye
- Oats (Saber)
- Red clover
- Crimson clover
- Dwarf Essex rapeseed
- Radish (Image)
- Mustard caliente
- Austrian winter pea
Cover crop planting

**SVREC:**
Sprayed: April 7
CC planted: July 28
(112 d after treatment)

**KBS:**
Sprayed: April 16
CC planted: July 30
(105 d after treatment)

**Campus:**
Sprayed: April 26
CC planted: July 28
(91 d after treatment)
Establishment – 28 DAP

- Annual ryegrass
- Cereal rye
- Oats
- Red clover
- Crimson clover
- Dwarf Essex rapeseed
- Radish
- Mustard
HPPD (Group 27) injury to red clover

Untreated

Huskie

Talinor
Huskie caused bleached leaf margins on crimson clover.
Plans for 2021/2022

• Prior to first frost, this year’s cover crops will be counted and harvested for biomass

• We would like to repeat this research in 2021/2022 at three locations

• Create factsheets that provide these recommendations to wheat growers
Impacts

• New recommendations will be developed on what cover crops can be safely established following applications of herbicides commonly used in winter wheat production.

• Recommendations will help ensure the successful establishment of cover crops that will ultimately lead to increases in crop yield.

• Resulting data will be added to the MSU Weed Control Guide for Field Crops (E-434) and presented in fact sheets, at extension meetings, and at www.MSUweeds.com.
Questions?