Control of Ragweed with Pre-Emergent Herbicides

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2018 Empire Expo – Cabbage Session, Syracuse, NY: January 16, 2018
Acknowledgements

Funding provided by:

• New York Cabbage Research & Development Program (CRDP)
Overall Project Objective:

• To improve broad-spectrum weed control while improving crop safety in transplanted cabbage.
## Introduction
PRE-Emergent Herbicides in Cabbage

<table>
<thead>
<tr>
<th>WSSA Group</th>
<th>Product and Rate/A</th>
<th>Active Ingredient</th>
<th>Application Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Treflan 1-2 pt</td>
<td>trifluralin</td>
<td>PPI</td>
</tr>
</tbody>
</table>
| 15         | Dual Magnum 0.5-1.3 pt* | S-metolachlor    | • PRE-transplant; or  
|            | (NY-Special Local Needs) |                  | • Up to 48 h post-transplant |
| 15         | Devrinol 50-DF/XT 2 lb | napropamide       | PPI                |
| 13         | Command 6.67-1.3 pt | clomazone         | PRE-transplant      |
| 14         | Goal 2XL 1-2 pt    | oxyfluorfen       | PRE-transplant      |
|            | Goaltender 0.5-1.0 pt** |              |                   |
| 3          | Prowl H₂O 1.0-2.1 pt | pendimethalin     | Directed spray 1-3 days  
|            |                    |                  | post-transplant      |

*Dual Magnum may not be used with Goal

**Goaltender 4-6 fl oz labeled (NY-SLN) for POST-emergent weed control

Timing: Min: 2 weeks post-transplanting, PHI: 35 days
Introduction

Dual Magnum

• Dual Magnum is more effective than Treflan
  • Added control of yellow nutsedge
  • Improved broadleaf weed control
    • Pigweed, hairy galingsoga, Eastern black nightshade
• Combining Dual Magnum with Goal was Robin Bellinder’s “gold standard” in her herbicide trials
  • Weak on ragweed, some species of mustards, sometimes Lamb’s quarters
• Dual Magnum, especially when used with Goal can result in stunting injury that delays early growth of newly transplanted plants, especially when conditions are cool and wet.
Introduction

New Formulation of Devrinol

• Devrinol 50 DF generally not favored by New York cabbage growers, because it has a short residual

• New formulation available: Devrinol DF-XL
  • Residual lasts 4-6 weeks
  • In Michigan studies, Devrinol XL was safer than Dual Magnum in cabbage, especially when used at cooler temperatures (< 60 °F).

Trial Objective:

• To compare Devrinol XL to 50 DF, Treflan and Dual Magnum and in combination with Goaltender to see if similar weed control may be achieved with improved crop safety.
Introduction

Prowl \( \text{H}_2\text{O} \)

- Prowl \( \text{H}_2\text{O} \) is under-utilized in cabbage
  - Labeled as a directed spray
  - In onions, Prowl is known for:
    - Excellent control of Lamb’s quarters (LQ)
    - Control of mustards (weakness of Dual Magnum +/- Goal)
    - Excellent crop safety (\( \text{H}_2\text{O} \))

**Trial Objective:**

- To evaluate crop safety and weed control of Prowl \( \text{H}_2\text{O} \) alone and in combination with Goaltender.
  - Especially interested in whether it improves control of LQ and **mustards** compared to Treflan/Dual Magnum +/- Goal
Introduction
Chateau (Not labeled in cabbage)

Chateau (a.i. flumioxazin):
• WSSA group 14 (like Goal)
• Both PRE and POST-emergent activity (weeds < 2inch) at low rates (1-2 oz/A)
• Excellent control of pigweed, smartweed, certain species of mustard
• Huge adoption rate in muck onion production
• Can have phytotoxicity issues...
• In 2016 herbicide, trial, Chateau 1 oz and 2 oz did not cause unacceptable damage to cabbage (hot & dry)

Trial Objective:
• To trial Chateau POST-transplant following Treflan (for crop safety).
  • Especially interested in whether it improves mustard control over Dual Magnum +/- Goal.
Introduction
Spartan (Not labelled in cabbage)

Spartan (a.i. sulfentrazone):
• WSSA group 14 (like Goal and Chateau)
• Labelled on processing cabbage in Michigan
• Robin was evaluating Spartan in cabbage: it should improve control of grasses, nightshade and pigweed

Trial Objective:
• Compare Spartan to Goaltender and half rates of Spartan + Goaltender when used in combination with Devrinol (Dual Magnum likely too hot).
## Treatments

<table>
<thead>
<tr>
<th>No.</th>
<th>PPI (Jun-13)</th>
<th>POST-Transplant (Jun-14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Untreated Check</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Handweeded Check</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Treflan 2 pt</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Devrinol <strong>50DF</strong> 2 lb</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Devrinol <strong>DF-XT</strong> 2 lb</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Dual Magnum 1 pt</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Dual Magnum 1 pt + Goaltender 0.5 pt</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>PPI (Jun-13)</td>
<td>POST-Transplant (Jun-14)</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>8</td>
<td>Devrinol <strong>DF-XT</strong> 2 lb</td>
<td>Goaltender 0.5 pt</td>
</tr>
<tr>
<td>9</td>
<td>Treflan 2 pt</td>
<td>Goaltender 0.5 pt</td>
</tr>
<tr>
<td>10</td>
<td>Devrinol <strong>DF-XT</strong> 2 lb</td>
<td>Spartan 6 fl oz</td>
</tr>
<tr>
<td>11</td>
<td>Devrinol <strong>DF-XT</strong> 2 lb</td>
<td><strong>Half-rates:</strong> Goaltender 0.25 pt + Spatan 3 fl oz</td>
</tr>
<tr>
<td>12</td>
<td>Treflan 2 pt</td>
<td>Chateau 1 oz</td>
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<td>15</td>
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<td>Prowl H₂O 2.1 pt + Goaltender 0.5 pt</td>
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</table>
Trial Design

- NYSAES Research Farm, Geneva, NY
- Soil type: Gravel loam
- Variety: Cabton
- CO2 backpack sprayer
- 4 replications

**Dates:**
- Planting: Jun-14
- PPI app: Jun-13
- POST-Transplant app (1 day): Jun-14

**VERY WET:**
- **11 inches of rain** from Jun 14 to Jul 30

**Major weed species:** Ragweed (RW), smartweed (SW), pigweed (PW), hairy galinsoga (HG), Lamb’s quarters (LQ), foxtail (fox)
Results

Crop Tolerance:

• **Crop Injury** – no injury observed in any treatment
  • Wet conditions may have impaired ability to detect stunting injury

• **No yield data taken** – extreme wet, waterlogged conditions and poor cabbage growth

Weed Control:

• **Pigweed**: 98-100% control (all treatments)

• **Smartweed**: 98-100% control (all treatments EXCEPT Treflan (75%))
Results – Percent Weed Control
Single Actives

- **Lamb’s quarters**
  - Treflan 2 pt PPI: 71.3%
  - Devrinol 50 DF 2 pt PPI: 94.3%
  - Devrinol DF-XT 2 pt PPI: 90.0%
  - Dual Magnum 1 pt POSTTR: 100%
  - Prowl H2O 2.1 pt POSTTR: 98.3%

- **Hairy Galingsoga**
  - Treflan 2 pt PPI: 52.9%
  - Devrinol 50 DF 2 pt PPI: 96.3%
  - Devrinol DF-XT 2 pt PPI: 100%
  - Dual Magnum 1 pt POSTTR: 100%
  - Prowl H2O 2.1 pt POSTTR: 76.4%

- **Common Ragweed**
  - Treflan 2 pt PPI: 14.8%
  - Devrinol 50 DF 2 pt PPI: 65.5%
  - Devrinol DF-XT 2 pt PPI: 53.8%
  - Dual Magnum 1 pt POSTTR: 68.6%
  - Prowl H2O 2.1 pt POSTTR: 17.2%

- **Foxtail**
  - Treflan 2 pt PPI: 42.5%
  - Devrinol 50 DF 2 pt PPI: 96.3%
  - Devrinol DF-XT 2 pt PPI: 100%
  - Dual Magnum 1 pt POSTTR: 97.8%
  - Prowl H2O 2.1 pt POSTTR: 76.3%

Significantly worse than best treatment
Results – Percent Weed Control
Single Actives

Lamb’s quarters

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<th>Control (%)</th>
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Common Ragweed

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Hairy Galingsoga

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Foxtail

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<th>Control (%)</th>
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</tr>
<tr>
<td>Dual Magnum 1 pt POSTTR</td>
<td>100</td>
</tr>
<tr>
<td>Prowl H2O 2.1 pt POSTTR</td>
<td>98.3</td>
</tr>
</tbody>
</table>

Significantly worse than best treatment + 17.5%
Results – Percent Weed Control
Single Actives 27 DAT

JULY 11, 2017

Untreated
Devrinol 50 DF 2 lb PPI
Dual Magnum 1 pt

Treflan 2 lb PPI
Devrinol DF-XT 2 lb PPI
Prowl H2O 2.1 pt POSTTR
Results – Percent Weed Control With Goaltenderer 0.5 pt

Percent Weed Control 50 DAT (Aug 3)

**Lamb's quarters**

- **Treflan**
  - Alone: 71.3%
  - Plus Goaltender: 73.3%

- **Devrinol DFXT**
  - Alone: 96.3%
  - Plus Goaltender: 96%

- **Dual Magnum**
  - Alone: 100%
  - Plus Goaltender: 98.3%

- **Prowl H2O**
  - Alone: 98.3%
  - Plus Goaltender: 98%

Goaltenderer did not appear to have any effect on LQ.
## Results – Percent Weed Control With Goaltender 0.5 pt

### Percent Weed Control 50 DAT (Aug 3): Hairy Galingsoga

<table>
<thead>
<tr>
<th>Product Combination</th>
<th>Without Goaltender</th>
<th>With Goaltender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treflan</td>
<td>52.9</td>
<td>83.8</td>
</tr>
<tr>
<td>Devrinol DFXT</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Dual Magnum</td>
<td>97.7</td>
<td>100</td>
</tr>
<tr>
<td>Prowl H2O</td>
<td>76.3</td>
<td>90</td>
</tr>
</tbody>
</table>

- **+31%** increase for Hairy Galingsoga with Devrinol DFXT + Goaltender.
- **+14%** increase for Dual Magnum + Goaltender.
Results – Percent Weed Control With Goaltender 0.5 pt

Percent Weed Control 50 DAT (Aug 3)

Common Ragweed

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Control Alone</th>
<th>Control Plus Goaltender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treflan</td>
<td>18.8</td>
<td>55</td>
</tr>
<tr>
<td>Devrinol DFXT</td>
<td>68.8</td>
<td>84.5</td>
</tr>
<tr>
<td>Dual Magnum</td>
<td>33.8</td>
<td>70</td>
</tr>
<tr>
<td>Prowl H2O</td>
<td>17.5</td>
<td>81.3</td>
</tr>
</tbody>
</table>

Significant difference

★ Significant difference

-alone, ★-plus Goaltender
Results – Percent Weed Control With Goaltender 0.5 pt

JULY 11, 2017

Treflan 2 lb PPI

Prowl H2O 2.1 pt POSTTR

Treflan 2 pt PPI + Goaltender 0.5 pt POSTTR

Prowl H2O 2.1 pt + Goaltender 0.5 pt POSTTR
Results – Percent Weed Control With GoalTender 0.5 pt

JULY 11, 2017

Devrinol DF-XT 2 lb PPI

Devrinol DF-XT 2 lb PPI + Goaltender 0.5 pt POSTTR

Dual Magnum 1 pt

Dual Magnum 1 pt + Goaltender 0.5 pt POSTTR
Results – Percent Weed Control With Chateau, Spartan

Percent Weed Control 50 DAT (Aug 3)

Lamb's quarters

- Chateau 1 oz + Chateau 2 oz
- Treflan
- Devrinol DFXT
- Dual Magnum
- Prowl H2O
- Spartan 6 fl oz
- Spartan 3 fl oz
- Goaltender 0.25 pt

Chateau had activity on LQ.
No rate effect; better than Goaltender
Results – Percent Weed Control With Chateau, Spartan

Percent Weed Control: Hairy Galingsoga

Chateau had activity on HG.
No rate effect; same as Goaltender
Results – Percent Weed Control With Chateau, Spartan

Percent Weed Control 50 DAT (Aug 3)

Common Ragweed

+38%  +16%  +36%  +64%

Treflan  + Chateau 1 oz  + Chateau 2 oz  + Spartan 6 fl oz  + Spartan 3 fl oz  + Goaltender 0.25 pt

Devrinol DFXT  + Devrinol DFXT + Goaltender  + Devrinol DFXT + Spartan  + Dual Magnum  + Dual Magnum + Goaltender

Prowl H2O  + Prowl H2O + Goaltender

Significant difference

Treflan PPI  Treflan + Goaltender  Treflan + Chateau 1 oz  Treflan + Chateau 2 oz  Devrinol DFXT  Devrinol DFXT + Goaltender  Devrinol DFXT + Spartan  Dual Magnum  Dual Magnum + Goaltender  Prowl H2O  Prowl H2O + Goaltender

Alone  Plus Goaltender
Results – Percent Weed Control With Chateau, Spartan

**Chateau:**
- Chateau had excellent activity on ragweed (RW)
- No rate effect, 1 oz was enough
- Chateau controlled RW better (twice as good) than Goaltender

**Spartan:**
- Spartan did not control RW as well as Goaltender
- Spartan + Goaltender controlled RW as well as Goaltender
- Did not identify any benefit to Spartan in this trial with respect to improving control of any of the weeds tested in this trial.
Results – Percent Weed Control With Chateau

JULY 11, 2017

Treflan 2 lb PPI

Treflan PPI 2 pt + Chateau 1 oz POSTTR

Treflan 2 pt PPI + Goaltender 0.5 pt POSTTR

Treflan 2 pt PPI + Chateau 2 oz POSTTR
Results – Percent Weed Control With Spartan

JULY 11, 2017

Devrinol DF-XT 2 lb PPI

Devrinol DF-XT 2 lb PPI + Spartan 6 fl oz

Devrinol DF-XT 2 lb PPI + Goaltender 0.5 pt POSTTR

Devrinol DF-XT 2 lb PPI + Goaltender 0.25 pt + Spartan 3 fl oz POSTTR
## Summary

### Relative Performance:

<table>
<thead>
<tr>
<th>Rank</th>
<th>Product</th>
<th>% Weed Control 50 DAT (Aug-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RW</td>
</tr>
<tr>
<td>1</td>
<td>Devrinol DF-XL</td>
<td>68.8</td>
</tr>
<tr>
<td>2</td>
<td>Dual Magnum</td>
<td>33.8</td>
</tr>
<tr>
<td>3</td>
<td>Devrinol 50-DF</td>
<td>51.3</td>
</tr>
<tr>
<td>4</td>
<td>Prowl H2O</td>
<td>17.5</td>
</tr>
<tr>
<td>5</td>
<td>Treflan</td>
<td>18.8</td>
</tr>
</tbody>
</table>

- **Green**: >95% control
- **Yellow**: < 50% control
Summary

• Addition of Goaltender 0.5 pt to Devrinol DF 50/XT, Dual Magnum, Treflan and Prowl H2O:
  • Increased control of ragweed
  • Increased control of hairy galinsoga with Treflan & Prowl H2O, which needed some help, unlike Dual Magnum and Devrinol

• Chateau improved control of LQ and ragweed better than Goaltender

• Spartan was not as good as Goaltender for control of ragweed.
  • ½ rates of Spartan + Goaltender was no different than Goaltender for control of ragweed
Future Research

• Continue to evaluate crop tolerance and yield of these treatments for improved crop safety
  • In a “normal” year
  • 2017:
    • Extremely wet conditions impaired ability to detect stunting
    • No yield data

• Investigate Prowl H2O and Chateau for improved control of mustards and lamb’s quarters

• Investigate Prowl H2O in combination with Chateau, Devrinol DF-XT and Dual Magnum, mostly for improved control of LQ and mustards.
Recommendation

• Try Devrinol DF-XT PPI +/- Goaltender for improved crop safety and weed control, especially for ragweed under cool soil conditions.

Let me know how it goes!