Influence of Various Cover Crop Species on Winter and Summer Annual Weed Emergence

Cody D. Cornelius, Alex Long, Mandy Bish, Meghan Biggs, and Kevin Bradley
University Of Missouri
Introduction

• Cover crops have increased in popularity in Midwest crop production systems

• A variety of cover crop species are now promoted; little is known about:
  – their suitability for Midwest corn/soybean rotations
  – ability to reduce winter and summer annual weed emergence
Objectives

To determine the effects of various cover crop species on cumulative winter and summer annual weed emergence in soybean.
Materials and Methods

General: Identical field experiment conducted at 5 locations in 2013 and 2014; individual plots 3 x 14 m; treatments arranged in a RCB design with 4 replications

Planting Dates: September 11, 2012; September 11, 2013

Seeding Rates (kg/ha):

- Wheat = 135
- Cereal Rye = 123
- Italian ryegrass = 28
- Oats = 78
- Crimson Clover = 34
- Austrian Winter Pea = 56
- Hairy Vetch = 34
- Tillage Radish = 11
- Cereal Rye+Hairy Vetch = 78+34
Materials and Methods

- **Herbicide Applications:** Made with a CO$_2$-powered backpack sprayer delivering 15 GPA with XR8002 flat fan nozzles

- All cover crop species received a burndown application of glyphosate + 2,4-D ester (1.73 + 0.56 kg/ha) in the spring approximately 7 to 14 days prior to soybean planting

- Cover crop species were compared to 3 herbicide programs:

<table>
<thead>
<tr>
<th>Fall Herbicide Only</th>
<th>Spring Non-residual Burndown</th>
<th>Full Residual Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.86 kg glyphosate ae/ha +</td>
<td>0.86 kg glyphosate ae/ha +</td>
<td><strong>PRE:</strong> 1.74 kg glyphosate ae/ha +</td>
</tr>
<tr>
<td>0.56 kg 2,4-D/ha + 0.07 kg</td>
<td>0.56 kg 2,4-D/ha</td>
<td>0.56 kg 2,4-D/ha + 0.14 kg sulfentrazone/ha +</td>
</tr>
<tr>
<td>sulfentrazone/ha + 0.009 kg</td>
<td></td>
<td>0.018 kg chlorimuron/ha</td>
</tr>
<tr>
<td>kg chlorimuron/ha</td>
<td></td>
<td><strong>POST (~V3):</strong> 0.57 kg glufosinate ai/ha + 1.21 kg S-metolachlor/ha + 0.27 kg fomesafen/ha</td>
</tr>
</tbody>
</table>
Materials and Methods

Weed Density Data:
- Cumulative winter annual weed counts were made in two, 1-m² quadrats April 15, 2013; April 9, 2014
- Counts of all emerged weeds were made in two, 1-m² quadrats within each plot every two weeks beginning April 15th in 2013 and April 9th in 2014 and continuing to R3
- After each count, glufosinate was applied to eliminate all emerged species for that 2-wk period

Data Analysis: Weed counts analyzed using PROC GLIMMIX procedure in SAS. Means separated using Fisher’s Protected LSD at the 5% level of significance.
Influence of Cover Crops vs. Herbicide Treatments on Cumulative Winter Annual Weed Density
(results summarized across 5 sites in 2 years in Missouri)

*Bars followed by the same letter are not different, LSD_{0.05}*

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Influence of Cover Crops vs. Herbicide Treatments on Cumulative Summer Annual Weed Emergence
(results summarized across 5 sites in 2 years in Missouri)

Non-treated Control  ab
Fall Herbicide Only  ab
Spring Non-residual Burndown  bcd
Full Residual Program  d
Austrian Pea  abc
Hairy Vetch  ab
Crimson Clover  ab
Tillage Radish  a
Oats  abc
Italian Ryegrass  bcd
Cereal Rye/H. Vetch  cd
Cereal Rye  d
Wheat  ab

*Bars followed by the same letter are not different, LSD$_{0.05}$
Influence of Cover Crops vs. Herbicide Treatments on Early-season Summer Annual Weed Emergence

(results summarized across 5 sites in 2 years in Missouri)

*Bars followed by the same letter are not different, LSD

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Influence of Cover Crops vs. Herbicide Treatments on Late-season Summer Annual Weed Emergence
(results summarized across 5 sites in 2 years in Missouri)

- Non-treated Control
- Fall Herbicide Only
- Spring Non-residual Burndown
- Full Residual Program
- Austrian Pea
- Hairy Vetch
- Crimson Clover
- Tillage Radish
- Oats
- Italian Ryegrass
- Cereal Rye/H. Vetch
- Cereal Rye
- Wheat

*Bars followed by the same letter are not different, LSD$_{0.05}$

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Tillage Radish 12/3/2013
Columbia, Missouri
Influence of Cover Crops vs. Herbicide Treatments on Cumulative Waterhemp Emergence
(results summarized across 5 sites in 2 years in Missouri)

- Non-treated Control
- Fall Herbicide Only
- Spring Non-residual Burndown
- Full Residual Program
- Austrian Pea
- Hairy Vetch
- Crimson Clover
- Tillage Radish
- Oats
- Italian Ryegrass
- Cereal Rye/H. Vetch
- Cereal Rye
- Wheat

*Bars followed by the same letter are not different, LSD_{0.05}*

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Influence of Cover Crops vs. Herbicide Treatments on Early Season Waterhemp Emergence
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Influence of Cover Crops vs. Herbicide Treatments on Late Season Waterhemp Emergence

(results summarized across 5 sites in 2 years in Missouri)

*Bars followed by the same letter are not different, LSD$_{0.05}$. 

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Conclusions:

Influence of Cover Crops on Winter Annual Weed Density

All cover crop species reduced winter annual weed densities by 20 to 74% compared to the non-treated control:

- Cereal rye: 70%
- Cereal rye/vetch: 74%
- Wheat: 47%
- Fall herbicide: 99%
Conclusions:

Influence of Cover Crops on Summer Annual Weed Density

- Cereal rye, the mix of cereal rye + hairy vetch, and Italian ryegrass provided density reductions similar to the residual herbicide program.

- Few cover crops provided any substantial reduction in late-season weed emergence compared to the full residual program (90%).
Questions?