Synergizing cover crops and herbicide use

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Outline

• Terminating different cover crops successfully with herbicides
• Ensuring efficacy with residual herbicides
• Can cover crops replace herbicides?
TERMINATING COVER CROPS SUCCESSFULLY
Using a herbicide doesn’t guarantee success.
Goals of herbicide termination

1. Effective, timely kill to avoid complications with seasonal crop
2. Correct herbicide and adjuvant choice for the species and environment
3. Maximize efficiency by incorporating multiple passes together
Herbicides

• Termination success depends on several factors:
  – Cover crop species and growth stage (size)
  – Herbicide, rate & spray technique used
  – Environment

• Other important considerations:
  – Crop to be planted next
  – Weed species present in field

• Choices:
  – Glyphosate (grasses)
  – Glyphosate + 2,4-D or dicamba (legumes)
  – *Gramoxone (paraquat)
  – *Liberty (glufosinate)
Herbicide treatments for cereal rye termination

![Bar chart showing % control 28 DAT for different treatments and termination dates.]

- 28 oz Roundup Wmax
- 28 oz Roundup Wmax + 16 oz Clarity
- 28 oz Roundup Wmax + 1 oz Sharpen
- 28 oz Roundup Wmax + 1 qt Aatrex

- Early termination (April)
- Late termination (May)
Herbicide treatments for wheat termination

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Early termination (April)</th>
<th>Late termination (May)</th>
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</thead>
<tbody>
<tr>
<td>28 oz Roundup Wmax</td>
<td>100%</td>
<td>75%</td>
</tr>
<tr>
<td>28 oz Roundup Wmax + 1 pt 2,4-D</td>
<td>90%</td>
<td>80%</td>
</tr>
<tr>
<td>28 oz Roundup Wmax + 16 oz Clarity</td>
<td>85%</td>
<td>75%</td>
</tr>
<tr>
<td>28 oz Roundup Wmax + 1 oz Sharpen</td>
<td>80%</td>
<td>70%</td>
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Herbicide treatments for hairy vetch termination

- Early termination (April)
  - 28 oz Roundup Wmax + 1 pt 2,4-D: 100%
  - 28 oz Roundup Wmax + 16 oz Clarity: 95%
  - 4 pt Gramoxone + 1 pt 2,4-D: 90%
  - 4 pt Gramoxone + 1 qt Aatrex: 85%

- Late termination (May)
  - 28 oz Roundup Wmax + 1 pt 2,4-D: 85%
  - 28 oz Roundup Wmax + 16 oz Clarity: 80%
  - 4 pt Gramoxone + 1 pt 2,4-D: 75%
  - 4 pt Gramoxone + 1 qt Aatrex: 70%
Use of UAN with burndown may cause termination failures in poor conditions.

- UAN improves burndown of small weeds
  - Causes quick contact burn to plants, similar to a contact herbicide
- Contact burn may reduce movement of glyphosate necessary to kill large cover crops
SE IOWA WORK – HERBICIDES FOR COVER CROP TERMINATION
Glyphosate, paraquat, or glufosinate?

1 week following treatment

Glyphosate, 1 lb ae/acre
Paraquat, 1 lb ae/acre
Glufosinate, 36 fl oz/acre
What are pounds acid equivalent?

Requires some math, but helps you accurately choose a rate with differently formulated products

1.0 INGREDIENTS

ACTIVE INGREDIENT:
* Glyphosate, N-(phosphonomethyl)glycine, in the form of its potassium salt .................................................. 48.8%

OTHER INGREDIENTS: ........................................................................................................................................ 51.2%

........................................................................................................................................... 100.0%

* Contains 660 grams of the active ingredient glyphosate, in the form of its potassium salt, per liter or 5.5 pounds per U.S. gallon, which is equivalent to 540 grams of the acid, glyphosate, per liter or 4.5 pounds per U.S. gallon (39.8% by weight).

For a list of patents, if any, covering this product or its use, please go to www.monsantotechnology.com.
What are pounds acid equivalent?

1 fl oz = 0.035 lb ae
1 lb ae = ~28 fl oz of this formulation

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Glyphosate, paraquat, or glufosinate?

3 weeks following treatment

- Glyphosate, 1 lb ae/acre
- Paraquat, 1 lb ae/acre
- Glufosinate, 36 fl oz/acre
Glyphosate, paraquat, or glufosinate?

2 weeks following treatment

Glyphosate, 1 lb ae/acre
Paraquat, 1 lb ae/acre
Glufosinate, 36 fl oz/acre

Day of spray treatment

Untreated
ENSURING EFFICACY WITH RESIDUAL HERBICIDES
Mixing residual herbicides with burndown may slow or prevent effective cover crop kill.

- Many farmers incorporate preemergence (residual) herbicides with a burndown for cover crops
  - Many preemergence herbicides have some activity on emerged weeds (usually contact burn)

- 12” tall rye sprayed with metribuzin + glyphosate
  - Plots with metribuzin took longer to die
Do residual herbicides reach the soil surface?

- Residual herbicides must reach soil surface to kill germinating weeds

- When do residual herbicides applied to tall cover crops reach the soil?

- Likely not a big concern if cover crop is small and terminated early
Do residual herbicides reach the soil surface?

- Amount of herbicide reaching soil surface is inversely related to biomass accumulation

![Graph showing sulfentrazone soil concentration (ng g⁻¹) over time](image-url)
Should we change herbicide programs for big cover crops?
Effect of residual application timing on waterhemp control

CAN COVER CROPS REPLACE HERBICIDES?
Key question: Can the cover crop sufficiently replace a herbicide pass?

Biomass is key to physically suppressing weeds!
In Iowa: planting date matters

Rye terminated on May 5. Feeke’s Stage 8-9 (flag leaf)
Does the cover crop alone control weeds?

- winter wheat
- oat
- winter vetch
- cereal rye/winter vetch mix
- cereal rye
- Austrian winter pea
- Italian ryegrass
- No tillage
- Tillage

% Control

- Waterhemp control
- Overall weed control

Cereal rye biomass vs weed suppression

Webster et al. 2013. Crop Protection

Threshold level necessary for consistent suppression of summer annual weeds noted by Mirsky et al. 2013. Weed Technology

Rye biomass levels observed in ISU research

% Palmer amaranth control (6 weeks after planting)

Cover crop biomass (lb/A)
Effect of rye cover crop on Iowa waterhemp emergence patterns

Control

Sept. Planting

Time to 50% emergence delayed two weeks by rye

IOWA STATE UNIVERSITY
Extension and Outreach
How can we reduce cost? 
Layered residual herbicide program

Can the cover crop act as a first herbicide pass?
Program with early cover crop termination

First herbicide application to terminate cover crop with residual herbicide included

Canopy development

Residual herbicide necessary at termination

Cover crop suppression depletes as it degrades

% canopy closure
% control remaining

April     May     June     July

Bob Hartzler, 2017
Program with later cover crop termination

First herbicide application to terminate cover crop with no residual herbicide included

Cover crop – suppression depletes as it degrades

First application of residual herbicide

Canopy development

Cover crop may act as a residual herbicide for up to ~6 weeks

May
June
July

% canopy closure
% control remaining
Can this actually work?

• Yes, but:
  – Requires even stand of cover crop
  – High biomass accumulation
  – Late planting of crop (?)

• Real potential to make this work in soybean!
  – May be field-specific or specific to parts of fields
Summary

• Terminating an overwintering cover crop is not hard but requires appropriate prep
  – Many ways to “get the job done” but efficiency can add risk

• We now know that the residual herbicide can get “hung up” in large cover crops

• If your cover crop stand is even, it can act as a short-lived “residual herbicide”
  – This can mean money in your pocket and fewer weeds!