Impact of Wheat Herbicide Residues on Fall-Seeded Cover crops

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Considerations for a cover cropping system

• Goals for the system
• Herbicide history
  o Cover vs forage crop
Knowledge gaps with cover crops

• Are cover crops on herbicide labels?

• Typically we have to use similar crop species to gauge cover crop safety (WCG pp. 104-106)
  – Is that reliable?
Identify in-season wheat herbicides that increase risk to cover crop establishment following wheat harvest
Mike Ostlie – Carrington Research Extension Center
Caleb Dalley (Hettinger) and Kirk Howatt (Fargo)
Wheat herbicide residues and cover crops

- 5 site-years
  - 3 locations (Fargo, Carrington, and Hettinger) and 2 years (2016-17)
- Compared combinations of 9 cover crops (CC) and 9 herbicides: 81 combinations
  - Wheat sprayed at 3-4 leaf
  - Chose a range of active ingredients with potential residuals of >60 days
  - High-end rates were used for all products
- CC direct seeded within 7-10 days of wheat harvest
Wheat herbicide impact on fall-seeded cover crops, Carrington, 2017

October 9, 2017
Wheat herbicide residues and cover crops

• Measured injury to each cover crop and assigned a risk score to each cover crop/herbicide combination
  - LR – 0-20% damage safe
  - MR – 21-50% damage might be ok
  - HR – 51-100% damage not ok
2018 NORTH DAKOTA WEED CONTROL GUIDE

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THIS PUBLICATION SUPERCEDES ALL PREVIOUS ISSUES OF W-253 SUBJECT TO CONDITIONS UNDER “WEED GUIDE INFORMATION”

www.ndsu.edu/weeds/

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NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION

JANUARY 2018
Herbicide residue and fall cover crop establishment.

Late summer fall-seeded cover crops promise soil health, prevent water quality, and enhance wildlife habitat. Cover crop response to spring-applied herbicides is limited but crop tolerance research is ongoing at several academic institutions. Herbicides labels may also be expanded to promote soil quality efforts on establishment of cover crops. Refer to pages 101 to 104 for current data base. Use rotational restrictions of common or herbicide effectiveness on common weeds with those relatives of all seeded cover crops.

- Use atrazine for other legumes or perennial flowers.
- Use chlorsulfuron for Clethra species and turnips.
- Use small grains and wild oats for other grasses species.

**Herbicide rate, half life values, and comments.**

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Rate/A</th>
<th>Half-life (days)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>0.5 to 1 pt</td>
<td>7</td>
<td>Allow 50 days prior to planting broadleaf crops.</td>
</tr>
<tr>
<td>Dicamba</td>
<td>0.5 to 1 pt</td>
<td>5 to 14</td>
<td>Allow 45 days prior to planting broadleaf crops.</td>
</tr>
<tr>
<td>Dual I Magnum</td>
<td>1 to 2 pt</td>
<td>10 to 15</td>
<td>Regress may be more susceptible than other crops.</td>
</tr>
<tr>
<td>Parhedral</td>
<td>0.75 to 1 pt</td>
<td>100</td>
<td>Small seeded legume and brassica crops may be more susceptible than other crops.</td>
</tr>
<tr>
<td>Glufosinate</td>
<td>32 to 40 fl oz</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Liberty</td>
<td>20 to 30 fl oz</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Spartan</td>
<td>5 to 12 fl oz</td>
<td>60</td>
<td>Regress may be more susceptible than other crops.</td>
</tr>
<tr>
<td>Valor</td>
<td>2 to 10 fl oz</td>
<td>12-18</td>
<td>Small seeded legume and brassica crops may be more susceptible than other crops.</td>
</tr>
</tbody>
</table>

*Note: In general, herbicides with half lives of 30 days or less should allow planting of cover crops only after 10 weeks.*

**Table of cover crop injury based on highest damage recorded at 5 ND locations in 2016-2017.**

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Radish</th>
<th>Turnip</th>
<th>Field pea</th>
<th>Lentil</th>
<th>Flax</th>
<th>Cot</th>
<th>Hay</th>
<th>Dwar Essex Rape</th>
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<tbody>
<tr>
<td>Dicamba</td>
<td>MD</td>
<td>MD</td>
<td>LR</td>
<td>MR</td>
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<td>MR</td>
<td>MR</td>
<td>MR</td>
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<tr>
<td>Everest</td>
<td>MR</td>
<td>MR</td>
<td>LR</td>
<td>MR</td>
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<td>MR</td>
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<td>Octad</td>
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<td>MR</td>
<td>LR</td>
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<tr>
<td>Hookle</td>
<td>MR</td>
<td>MR</td>
<td>LR</td>
<td>MR</td>
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<tr>
<td>Power-Flex</td>
<td>MR</td>
<td>MR</td>
<td>LR</td>
<td>MR</td>
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<tr>
<td>Quizal</td>
<td>MR</td>
<td>MR</td>
<td>LR</td>
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<tr>
<td>Superior</td>
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<td>MR</td>
<td>LR</td>
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<td>Vapo</td>
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<tr>
<td>Weed-Sheath</td>
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<td>MR</td>
<td>LR</td>
<td>MR</td>
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<td>MR</td>
<td>MR</td>
</tr>
<tr>
<td>2,4-D</td>
<td>MR</td>
<td>MR</td>
<td>LR</td>
<td>MR</td>
<td>MR</td>
<td>MR</td>
<td>MR</td>
<td>MR</td>
</tr>
</tbody>
</table>

*In general, herbicides:

- LR = low risk: 0 to 20% injury.
- MR = medium risk: 21 to 50% injury.
- HR = high risk: >51% injury. Drive through in severe injury. Products were chosen due to known residue activity. Other products may be safe for cover crops. This list is not all-inclusive. Most economics of median or high risk test were well above in only one environment. Most combinations were LR in most environments. High OM, high rainfall, sludge, low pH, and other factors will reduce the risk of herbicide carryover to cover crops. If cover crops will be grazed or harvested in some way (including hayed), refer to label regarding grazing restrictions.*

For additional information modules:

- Herbicide Rotation Restrictions in Forages and Cover Cropping Systems
  http://wssrc.data.gsu.edu/my/harie/delt.herbicide.citation.restrictions.in.forages.cover-cropping-systems
  by the University of Georgia, June 2016. It contains tables summarizing the restrictions on species in markets along with specific restrictions for forages. Growers often commonly used herbicide applications in small grains, soybean, and corn.

- Managing risk when using herbicides and cover crops in corn and soybean
  http://www.extension.umn.edu/distribution/health_and_safety/cover_crops/herbicide_rotation.html
  by University of Minnesota Extension, Spring 2016.

- Herbicide Use May Restrict Grazing Options for Cover Crops
  https://ndext.ace.cornell.edu/prod/headhome/prod/angryoptionsforcovercrops
  by Utah State University Extension, December 2016.
General results

- Locations varied greatly – this is ok
  - Fargo had least injury, Carrington had the most
  - Hettinger was more similar to Fargo

- 3 crops with danger signs
  - Field pea, lentil, turnip
  - Several others are at-risk if conditions are favorable for carryover
Summary

• One must consider what risk means
  – A rating of MR means that noticeable injury occurred in one or two environments for this study (out of 5). The other environments had conditions more favorable to herbicide breakdown.
  – One must consider the environment
    • The given table is a guide to determine risk, but risk can be elevated or alleviated depending on the region (soil texture, pH, OM, etc) and environment (rainfall, soil moisture, etc).
Example

• A tank-mixture of Varro and WideMatch was applied to spring wheat on May 30 to control group 1 resistant green foxtail, wild oat, kochia and wild buckwheat. Crop was harvested August 1 and sunflower is planned for next year. A cover crop mixture of radish with bin-run barley and field pea will be planted by August 15 into the wheat stubble, primarily for additional snow trap and long-term improvement in soil productivity.

• Is this a good cover crop mix considering herbicides previously used?
• Are there better cover crop substitutes?
Cover crop labeling

• It is important to differentiate cover crops with forage crops
  – If the ‘cover crop’ is being harvested in some manner, it will be subject to herbicide plant-back restrictions, if indicated.
  – Cover crops for soil health (all biomass left in the field) are a gray area and considered exempt from plant-back restrictions
Cover crops for grazing

• Iowa state publication
  – Easy to follow, but limited to corn and soy products
  – https://store.extension.iastate.edu/Product/Herbicide-use-may-restrict-grazing-options-for-cover-crops
  – Check label of potential products to ensure there are no grazing restrictions
    • pp. 110-112 in ND Weed Control Guide
Questions or comments?