

Effect of residual herbicides on cover crop establishment

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The use of preemergence herbicides has increased in recent years due to the spread of herbicide resistant weeds. Many of these products are persistent in the environment, and phytotoxic concentrations may remain in the soil at the time of cover crop establishment in the fall. While herbicide labels provide information on restrictions regarding rotational crops, these recommendations generally are not written with cover crops in mind. Restrictions on the label that prohibit planting cover crops may be due to: 1) the risk of herbicide residues causing establishment failures; 2) the risk of herbicide residues accumulating in the cover crop for which residue tolerances have not been established; 3) a lack of data determining the safety of the herbicide on the cover crop; and 4) a combination of the above factors.

The first thing to consider when evaluating the risk a herbicide poses to cover crops is the potential use of the cover crop. If there is any possibility that the cover crop will be grazed or harvested for forage, all restrictions regarding rotational crops must be followed. This is necessary to prevent residues of herbicides being fed to animals that are not cleared for consumption (residue tolerance). If a cover crop is only being used for conservation purposes, then the grower can choose to plant a cover crop that is prohibited on the label. However, the grower accepts all responsibility if the herbicide interferes with establishment of the cover crop in this situation. A bulletin from the University of Wisconsin, *Herbicide rotation restrictions in forage and cover cropping systems: WCWS 201*, describes the rotation restrictions on labels of most commonly used herbicides. It is available on the University of Wisconsin's website (wcws.cals.wisc.edu).

The potential for herbicides to prevent successful establishment of cover crops is an important consideration. The threat posed by a

herbicide is determined by the chemical's half-life and availability in the soil, sensitivity of the cover crop species, herbicide application rate and date, and environmental conditions throughout the growing season. Late herbicide applications and limited rainfall following application will increase the potential for crop injury. The relatively short time period between cover crop planting dates and the onset of cool fall temperatures increases the risk that herbicides pose to cover crops.

Determining the potential impact of herbicides on cover crops is made difficult by the large number of herbicides used in corn and soybean production and the number of species promoted as cover crops. We evaluated the response of five cover crop species to several persistent herbicides commonly used in Iowa corn and soybean production. Herbicides were selected based on their half-lives and/or known problems with carryover injury to traditional rotational crops. All experiments were conducted in the greenhouse, thus the studies provide information on the relative tolerance of the cover crops to the herbicides rather than an assessment of actual risk under field conditions. Herbicides were sprayed at rates from 1/8 to 1/2 of the label rate, incorporated into the soil, cover crops were seeded and then injury was evaluated for four weeks.

Results of the greenhouse trials are summarized in Table 1. The ratings are based on both the greenhouse experiments and experiences with herbicides in the field. Radish was the most sensitive of the cover crops evaluated, with significant injury occurring with all herbicides except Dual II Magnum. Cereal rye was the most tolerant of the cover crops. Hornet caused serious injury to plant death on the three broadleaf species, whereas Corvus affected the growth and vigor of all species.

Table 1. Relative tolerance of several cover crop species to herbicides commonly used in corn and soybean production. Injury potential ratings are based on greenhouse trial.

| Herbicide | Group No. | 1X Rate | Cereal rye | Oat | Hairy vetch | Lentil | Radish |
|-------------------------|-----------|-----------|-------------------------------|-----|-------------|----------|----------|
| <i>Corn products</i> | | | Injury Potential ¹ | | | | |
| Atrazine 90DF | 5 | 1.1 lb | 2 | 2 | 2 | 2 | 2 |
| Dual II Magnum | 15 | 1.5 pt | 2 | 1 | 1 | 1 | 1 |
| Balance Flexx | 27 | 5 fl oz | 1 | 1 | 2 | 2 | 3 |
| Callisto | 27 | 3 fl oz | 1 | 1 | 1 | 2 | 2 |
| Laudis | 27 | 3 fl oz | 1 | 1 | 2 | 2 | 2 |
| Corvus | 2, 27 | 5.6 fl oz | 2 | 2 | 2 | 2 | 3 |
| Hornet WDG | 2, 4 | 5 oz | 1 | 1 | 3 | 3 | 3 |
| <i>Soybean products</i> | | | | | | | |
| Classic | 2 | 1 oz | 1 | 1 | 1 | 1 | 2 |
| Pursuit | 2 | 4 fl oz | 1 | 1 | 1 | 1 | 2 |
| Prowl H ₂ O | 3 | 3 pt | 2 | 2 | 1 | 1 | 1 |
| Reflex | 14 | 1.25 pt | 1 | 1 | 1 | 1 | 2 |

¹Injury Potential: 1 = little or no risk; 2 = some risk depending upon herbicide rate and environmental factors; 3 = high potential for injury affecting cover crop establishment.

Summary There are many benefits associated with inclusion of cover crops into the corn/soybean cropping systems that dominate the Iowa landscape. Our relatively short growing season limits the time period for growth of cover crops following planting and the onset of dormancy, this increases the threat posed by herbicide residues. Cereal rye has a relatively high tolerance to the herbicides commonly used in corn and soybean, and under most situations

its establishment should not be affected by herbicides used earlier in the growing season. Other cover crop species are more sensitive to herbicides, and the potential impacts of herbicides on their establishment should be considered. Finally, always follow any rotational restrictions on the herbicide label when cover crops might be harvested for forage or grazed.

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