

## Cover Crop Removal

- Cover crops can help improve soil quality and nutrient values, control soil erosion, and improve water and air quality.
- Proper timing and method of termination are required for successful cover crop removal.
- Timing for removal/termination of a spring growing cover crop is critical because the cover crop should not be allowed to become weedy and/or hinder crop production.

### Timing of Removal

Timing of cover crop removal is specific to each farming operation. Cover crop termination four to eight weeks prior to commercial crop planting can allow soil warming, residue drying and decomposition, and soil water replenishment. Termination that occurs less than four weeks before commercial crop planting can help provide benefits of increased soil and water conservation, cover crop biomass, and possible nitrogen sources from legume cover crops.<sup>1</sup>

Nitrogen release and commercial crop yields can be affected by timing of cover crop removal. Early termination of small grain cover crops can result in more rapid decomposition of the residue due to the narrow carbon to nitrogen ratio of young plant tissue. Carbon to nitrogen ratios of 30 to 1 and greater are reached at the flowering stage of small grains.<sup>2</sup> This wider ratio may be desirable for increasing residue coverage and above-ground biomass production. The following crop should be considered when terminating cover crops. For example, winter-hardy cereals including winter rye, wheat, and triticale should be terminated at least two weeks prior to corn planting to avoid corn yield reduction.<sup>3</sup>

### Method of Termination

Cover crops may include broadleaves, grasses, legumes, or a mixture of all three. Typically, one of four methods is used to terminate a cover crop: applying herbicides, tilling, winterkill, and mowing. A 2014 survey found that approximately 48 percent of cover crop growers applied herbicides, 21 percent used tillage, 20 percent depended on winter kill, 10 percent terminated cover crops with mowing, 1 percent reported using a roller-crimper, and 6 percent used some other method to terminate cover crops.<sup>4</sup> Winterkill is a method in which the cover crop is left until it is terminated by a hard frost. This method is only possible in certain climates and for certain cover crops that are susceptible to the first hard frost (temperatures below 25° F), such as turnip and radish.<sup>2</sup> While tillage is a more common method of terminating cover crops than relying on winterkill, the use of tillage to terminate a cover crop can be expensive and can negate the benefits of the cover crops.



Figure 1. Annual ryegrass growth in the spring should be controlled as the first node is just beginning to form.

**Mechanical.** Aside from tillage, other mechanical methods of cover crop termination include use of a roller-crimper or mower. Roller-crimpers (mechanical rollers) can be used to kill tall-growing cover crops by breaking or crimping the stem. This method can be effective when used on cover crops at the flowering stage or later.<sup>2</sup> Mow-kill is a method of cover crop removal that is effective on some species. Residue distribution and cover crop regrowth should be evaluated when mowing is used for termination.

**Herbicide.** Effective herbicides that come in contact with the target plant are absorbed at the leaf surface and move to the site of action at a lethal dose. The following factors should be considered when selecting herbicides for cover crop termination:

- **Herbicide contact with target plants.** A cover crop mixture of grasses and broadleaves has different plant heights and

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structures and requires non-selective herbicides for control. Large plants that are bolting, jointing, or in reproductive stages may need greater herbicide rates or additional termination methods.

- **Herbicide absorption at the leaf surface.** Non-selective herbicides may be contact herbicides (Gramoxone® brands, glufosinate) or systemic (glyphosate). Systemic herbicides are translocated to the site of action, but the rate of translocation is influenced by plant metabolism. Actively growing crops have metabolisms that will move applied herbicides to the site of action. Therefore, applications should be made after several days of daytime temperatures in the high 50° to low 60° F range and nighttime temperatures are greater than 40° F.<sup>5</sup>
- **Herbicide is at a lethal dose.** Moist soil conditions in the spring can delay field work, which help cover crops to reach advanced height and growth stages. Therefore, full rates of herbicide are needed to control larger plants and avoid selection for herbicide-resistant plants.

Spring conditions may affect activity from a single herbicide application more than activity from a tank mixture of herbicides. A tank mix of Roundup WeatherMAX® herbicide with 2,4-D ester or dicamba can improve broadleaf termination.<sup>6</sup> Other herbicides may be necessary if weed species are present; however, herbicides used to terminate cover crops should be selected to avoid carryover to spring-planted commercial crops. Also avoid tank mixtures of glyphosate with a contact or burn type herbicide, as it can reduce the ability of plants to absorb and translocate glyphosate.

## Recommendations for Cover Crop Removal

### **Right rate of Roundup WeatherMAX herbicide (4.5 lb ae/gal):**

- Spring application: use at least 44 oz/acre
- Fall application: use at least 32 oz/acre

### **Ammonium sulfate (AMS):**

- 8.5 lb to 17 lb (or 2.5 to 5 gal liquid AMS) per 100 gal spray solution

### **Tank mixture with additional herbicide:**

- 2,4-D (1 to 2 pt/acre) OR
- dicamba (8 to 16 oz/acre)

### **Follow proper mixing order:**

- Water, AMS, dry product, agitate, drift control agent, liquids, glyphosate

### **Ensure good coverage:**

- 10 to 15 GPA, medium to coarse droplets

### **Spray at the right time:**

- Actively growing plant

## Tips for Annual Ryegrass Removal

- 1) Roundup® agricultural herbicides should be used at a full rate (44 fl. oz/acre).
- 2) Atrazine and mesotrione tank mixtures with Roundup agricultural herbicides should be avoided.
- 3) Control is most effective prior to when the first node/joint is formed. Once the third node/joint appears, control is poor because of limited translocation, as active growth in the plant goes to reproduction.
- 4) Scouting fields, confirming complete death of all cover crops, and determining further control need(s) should be practiced.
- 5) A second herbicide application with alternate mode of action, such as tank mix of Gramoxone® brands + atrazine, should be considered.
- 6) Herbicide applications late in the day, approximately three to four hours before sunset should be avoided.

## **Summary**

- Growers should make decisions for timing and method of cover crop removal prior to seeding and be prepared to amend the plan according to weather.
- A proper application should be made the first time as the first herbicide application is the most important.
- Control methods should be evaluated for escapes a couple weeks after application and into the growing season.

For additional agronomic information, please contact your local seed representative.

**Sources:** <sup>1</sup> Schomberg, H. and Balkcom, K. 2009. Cover crops. Soil quality for environmental health. <http://soilquality.org/>. <sup>2</sup> Sustainable agriculture research and education. 2012. Managing cover crops profitably (3<sup>rd</sup> edition). <sup>3</sup> Singer, J. 2006. Cover crops in the Corn Belt: Survey finds underused potential as conservation tool. Leopold Center for Sustainable Agriculture. Iowa State University. <http://www.leopold.iastate.edu/>. <sup>4</sup> Conservation Technology Information Center and Sustainable Agriculture Research and Education. 2014. 2013-2014 Cover crop survey report. <sup>5</sup> Loux, M. 2007. Burndown herbicide activity—can we kill anything when it's this cold? C.O.R.N. Newsletter 2007-08. The Ohio State University. <http://corn.osu.edu/>. <sup>6</sup> Legleiter, T., Johnson, B., Jordan, T., and Gibson, K. 2012. Successful cover crop termination with herbicides. Purdue University. WS-50-W. Web sources verified 12/23/14.

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