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# WINTER ANNUAL WEED MANAGEMENT

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## Introduction

Winter annual weeds are becoming more prevalent in states to our south. We are starting to see similar changes in the weed spectrum in Wisconsin. The adoption of reduced tillage systems, particularly no-till systems, is probably the primary cause of this weed species/life cycle shift. Others speculate that warmer than normal winters may contribute to the more frequent encounters of winter annuals. This is only a partial explanation as winter annuals normally survive even harsh winters very well. They produce long-chained polymers that drop the freezing point inside the cells to well below freezing (Hall, 1999). Late falls do extend the period of winter annual germination and development, and mild winters probably allow a higher percentage of very small plants to survive. Regardless of the reason, the phenomenon of finding winter annuals more frequently is real.

First, let's define a winter annual. These are weeds that emerge in late summer or early fall, overwinter (often as a small rosette) and flower early the next spring. We have all seen older hay fields that are white with shepherd's purse in April or perhaps a winter wheat field that is infested with flowering pennycress in the spring. And who has not seen horseweed (marestail) pop up in a no-till soybean field where no burndown treatment was applied. We are also encountering common chickweed, catchweed bedstraw, smooth hawksbeard, smallflower buttercup, henbit, purslane speedwell and other less-than-common weeds in full flower as corn or soybeans are planted in no-till systems.

Many winter annual species can also germinate in the spring. This is certainly true of shepherd's purse. Other weeds have a very flexible life cycle. For example, white cockle is classified as a biennial or perennial and evening primrose is described as an annual, biennial or perennial. Other weeds are true summer annuals but can emerge very early in the season. These include wild buckwheat, the knotweeds, giant ragweed and lambsquarters. You will need to be able to identify all of these and to know their life cycle to make the best management decisions.

If you need help identifying the early emerging and flowering weeds in no-till systems, consult the new bulletin, "Early Spring Weeds of No-till Crop Production" (Fischel et al., 2000). It contains 45 species, most of which are found in Wisconsin.

## Management Options

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**Tillage.** Thorough tillage will eliminate most winter annual weeds but this is not an option in reduced and no-till systems. Even in a reduced tillage system that includes chisel plowing in the fall and secondary tillage before planting will control most winter annual weeds. Of course, tillage is also not an option in established alfalfa or winter wheat fields.

**Winter wheat.** When fall and early spring field monitoring detects winter annual weeds, plans must be made to control them on a timely basis if the weed density warrants treatment. While some herbicides are labeled for fall applications, in practice nearly all herbicides are applied in the spring. This allows producers to be sure the crop has survived winter and may also allow for a simultaneous application of liquid fertilizer and herbicide.

Timing is critical when applying herbicides with a growth regulator mode of action. Someone must monitor and determine the cereal growth stage to avoid causing serious crop injury if dicamba, 2,4-D or MCPA will be applied. Applications that contain one or more of these products must be done before the cereal reaches the jointing growth stage (Feeks scale 6). Buctril, Harmony Extra, Harmony GT, Stinger and Starane can be applied in the jointing stage. No herbicides can be applied once the cereal reaches the boot stage. Check page 155 of the 2003 Pest Management in Wisconsin Field Crops (Boerboom et al. 2000) for details on the timing of herbicide use and cereal growth stage.

**Hay fields.** The most common winter annuals in established alfalfa are shepherd's purse and common chickweed. Both are very sensitive to Sencor, Velpar, Pursuit and Raptor. Timing and costs are deterrents to using Sencor and Velpar. Both should be applied before alfalfa breaks dormancy in very early spring (unless they are applied on dry fertilizer that is spread when the foliage is dry). Pursuit and Raptor can be applied when the crop has greened up and the weeds are actively growing. Raptor has a shorter harvest interval than Pursuit (15 versus 30 days after application) but Pursuit is more economical.

**Fall Applications Before No-till Corn or Soybeans.** In general, we have and continue to discourage fall herbicide applications that are designed to control summer annual weeds. Such treatments may spread the work load, particularly for commercial applicators, but applying residual herbicides in October to kill weeds in April increases the likelihood of contaminating surface water, ground water or both.

However, applying herbicides in the fall to kill weeds that are present does make sense. We have done this for many years to kill perennial weeds in the fall. Previously, many old hay fields received atrazine in the fall before rotating to corn (This use of atrazine is no longer labeled.) and today we often see glyphosate with 2,4-D or dicamba applied to old hay fields in the fall.

In addition to old alfalfa fields, producers who have used no-tillage systems for several years are also finding weeds in corn and soybean fields after harvest. White cockle and dandelion are the two most common perennials and chickweeds (of various life cycles) and purslane speedwell, bedstraw and small flower buttercup (true winter annuals) are also being encountered.

Most of our neighboring states have done research with fall applications to control winter annual weeds. Here is a summary of what they are reporting.

Missouri weed scientists noted that 2,4-D alone in the fall is very effective on henbit and daisy fleabane. However, the caution that the benefit of fall applied herbicides having a cleaner field at planting time will depend greatly on spring weather. If conditions are relatively dry and planting is done at "normal" times, no additional burndown treatment will be needed. If on the other hand, spring rains are persistent and planting is delayed, a spring burndown treatment may well be needed (Johnson, 2001).

The same can certainly happen in Wisconsin. The fall 2001 application of non-residual herbicides made to control dandelions after corn was harvested for grain failed to control erect knotweed in the spring of 2002 (Doll 2002). Adding Synchrony to the fall program controlled knotweed that germinated in all the other treatments the following spring. Non-residual spring applications also controlled knotweed, reflecting the very early emergence of this summer annual weed.

The situation is much worse in wet springs if winter annuals abound and no fall application was made. Then the uncontrolled weeds quickly develop dense mats of vegetation that can interfere with tillage and planting, provide habitats for insects and diseases, keep soils from warming and drying to facilitate optimum planting conditions, and may produce seed to perpetuate the annual weed pressure well into the future.

The Univ. of Illinois has researched fall applications in corn/soybean rotations for several years (Sprague et al. 2002). Fall treatments were most consistent and beneficial in the southern regions of the state as winter annual growth is most prolific in warmer climates. Most treatments were effective in killing the winter annuals but only those with residual activity controlled summer annual weeds like common and giant ragweed and common lambsquarters. Control of winter annual weeds at soybean planting time was similar whether the high temperature at the time of application was 25 or 65F.

Many have asked "how late can I treat winter annual weeds?" Applications should be timed so that all weeds that might emerge and develop sufficiently to survive winter are present when treatments are made. We suggest applying after grain harvest but not before early October and into early November. All winter annuals are very frost tolerant; if not, they would not survive winter. Treatment even after a hard frost can be effective. Try to apply when the high temperature the day of treatment will be 50F or greater. This is not as difficult as might be thought. The 30-year temperature data shows that the average high temperature at Madison drops below 50F on November 4. The date of this event for Green Bay and Eau Claire is Oct. 28.

Given that we often have temperatures above average, waiting until November to treat winter annuals should not be difficult. In 2001, I applied fall treatments on November 2 when the high temperature was 60F. The next day the high was 64F. On November 7, 2002, I treated shepherd's purse and dandelion at Arlington and the high temperature was 56F.

**Spring Applications Before No-till Corn or Soybeans.** The general rule of thumb for weed management in no-till systems is "start with a clean slate." If weeds are emerged and growing before the crop is planted, the competitive edge is clearly in favor of the weeds. Producers who

have treated only the obviously green areas of fields with a spring burndown application most often regret not having treated the entire field. One producer described the use of a burndown in situations with few visible weeds of also "killing the no see 'ems." These are the weeds that had just emerged and not visible at first glance but are killed by a timely burndown application.

The advent of glyphosate resistant crops gives growers the option of planting first and spraying later. This is fine and not a problem unless the "spraying later" attitude is taken to extremes. And what is an extreme? Research in the Midwest has rather conclusively shown that postemergence applications in corn must be made when annual weeds are 2 to 4 inches tall and in soybeans when weeds are no more than 6 inches tall. For some winter annual and early emerging summer annual weeds, these heights occur with a week or two of planting and if producers wait until corn is 6 to 8 inches tall and soybean 4 to 6 inches tall to treat, weeds will be well beyond the recommended heights. The take home message is that a timely burndown application allows the normal in-crop postemergence treatment to be done on a timely basis for weeds that emerge after with the crop. Then a subsequent cultivation (in corn) or simply crop competition (in soybeans) will provide the needed weed suppression.

The issue of resistance management should be mentioned. The less frequently the same herbicide mode of action is used the longer we will delay the onset of tolerant and resistant weeds. Mode of action rotation will also limit shifts to weed species that are adapted to a particular MOA. Paraquat (Gramoxone) controls most winter annual weeds and is a valid alternative to glyphosate as a burndown treatment. Because paraquat has only contact action and is not appreciably translocated from the treated foliage, it will not kill perennials like quackgrass or dandelion. However, it will kill the treated foliage of all species and if glyphosate resistant crops are planted, most perennial weeds will be killed with the postemergence glyphosate application. When doing research on perennial weed control in glyphosate resistant crops, I typically use paraquat as a burndown to give the crop an opportunity to emerge and begin growth with minimal weed interference. The perennial weeds recover and allow me to make in-crop treatments at the appropriate time.

**Specific Control Recommendations**. Several states include herbicide performance tables for the burndown treatments in their annual herbicide recommendation bulletins. Two that you may wish to consult on the internet are Ohio's (http://ohioline.osu.edu/b789/ ) and Nebraska's (http://www.ianr.unl.edu/pubs/fieldcrops/ec02130.pdf ). Canadian weed scientists are also seeing an increase in winter annual weeds and have a very useful bulletin on fall applications to control them. It is available on-line at: http://www.agric.gov.ab.ca/agdex/500/1900005.html. The title of the bulletin is "Winter Annual Weed Control in Direct Seeding Systems" and targets no-till (direct seeding) systems.

## Summary

The take home messages regarding winter annual weeds are as follows:

1. In reduced tillage systems, and especially in no-till systems, monitor fields carefully soon after crop harvest. Winter annual weeds are often already present, especially after corn harvest.

2. Know how to identify winter annual versus perennial weeds. This is not difficult but you will

need to become familiar with recognizing weeds at relatively young growth stages. Weeds to focus on include horseweed, chickweeds, henbit, prickly lettuce, shepherd's purse, pennycress, smooth hawksbeard, bedstraw and purslane speedwell.

3. Where appropriate, consider fall applications to ensure a weed-free start for no-till corn or soybeans.

4. Consider using non-glyphosate systems to control winter annual weeds. Many are sensitive to fall-applied 2,4-D or dicamba alone or in combination. Paraquat will kill nearly all winter annuals in the spring and has no waiting period between application and planting.

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