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Seeing spots? Moths of a different color aid in corn borer resistance research

Warm spring temperatures often mean squashed bugs on the windshield. If some of these insects are bright red or blue, don't be alarmed. They have been fed dyes and are part of ongoing University of Nebraska entomology research examining the movement and behavior of European corn borer moths. Results from this research have been used to develop resistance management recommendations that should slow the development of corn borer resistance to Bt corn.

Initial studies revealed significant differences between moth movement in and around irrigated and non-irrigated cornfields. Moths disperse readily from some non-irrigated cornfields. In irrigated cornfields, however, moths linger and many will mate in the same field where they emerged. Generally, females mate relatively close to where they emerged and males disperse farther away. Almost 95% of the unmated females that have been recaptured have been recaptured within about one-fourth mile of their release site.

Other factors, such as corn growth stage, also influence corn borer moth movement and behavior. For

(Continued on page 43)

Without rain, how will preemergence herbicides respond in the field?

With a lack of rainfall, low soil moisture and a dim outlook for significant rain, producers are questioning which preemergence herbicides will perform best. To answer this question, it helps to understand how much rain is needed to incorporate preemergence herbicides and how long the herbicides can remain on the soil surface without rainfall.

Preemergence herbicides need to be incorporated into the soil to

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**Drought videoconference**

NU Cooperative Extension will be hosting a videoconference on Livestock, Range and Forage Response in Drought at 8:30 p.m. CDT this Monday, April 17. The show is also expected to be cybercast at http://ruralroutes.unl.edu

Topics and speakers will include: weather forecast and subsoil moisture, Al Dutcher; livestock, culling strategies, herd make-up early weaning, and nutrition, Rick Rasby; Extension beef specialist; Grazing and grassland management, Jerry Volesky, Extension grazing specialist; other forage alternatives, Bruce Anderson, Extension forage specialist; and economics issues, Dick Clark, Extension ag economist.

Check with your local Extension office for details. Cooperative Extension offices in the following counties will downlink the videoconference and hold local discussions in conjunction with it: Lincoln, Buffalo, Dawson, Frontier, York, Otoe, Harlan, Alliance, Madison, Holt, South Central REC, Clay Center; Boone, Phelps, Cuming, Sioux, Knox, Hall, Scottsbluff and Custer.

**Gary Zoubek, Extension educator in York County:** Producers are finishing plans for planting and getting equipment calibrated. A few have started planting corn, but many have set April 17 as their starting date. Moisture conditions continue to be a concern especially in dryland cropping situations. The irrigated fields have a little more moisture in most situations, but could use considerably more rain to be filled to capacity.

**Terry Gompert, Knox County:** No insects at this time. The soils consultant says that moisture is 8 inches to 20 inches. It is dry under that level. The oats stubble land contains the best soil moisture.

We’ve received some reports that (Continued on page 46)

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**Personnel changes in Plant Pathology**

Since this time last year, three new members have been added to the Extension Plant Pathology Team. Based on this, I thought a brief review of our crop/plant disease responsibilities would be in order.

**Dr. Bob Harveson,** Panhandle Research and Extension Center, Scottsbluff

*Diseases of sugar beets, dry edible beans, sunflowers, potatoes and millet*

**Dr. Jim Stack,** South Central Research and Extension Center, Clay Center

*Diseases of corn and sorghum; mycotoxins*

**Dr. Loren Giesler,** Department of Plant Pathology, Lincoln

*Diseases of soybean, alfalfa, trees and landscape ornamentals*

**Ms. Jane Christensen**

Department of Plant Pathology
Lincoln, NE
*Plant & Pest Diagnostic Clinic.
Jane is temporarily managing the Plant & Pest Diagnostic Clinic on a part-time basis until that position is filled.

**Dr. John Watkins,** Department of Plant Pathology, Lincoln

*Diseases of small grains, turfgrasses, pastures and range grasses and home garden fruits and vegetables*

John E. Watkins
Extension Plant Pathologist

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**Crop Watch**

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Corn borer research (Continued from page 41)

example, corn borers that emerge in corn during pollen shed will tend to remain in and near the cornfield. Combine this with irrigation and one has a field that is very attractive to adult European corn borers.

These findings have implications for resistance management and reinforce the importance of using resistance management tactics such as refuge plantings (see Crop Watch, March 3 issue). Corn borer moths are most likely to remain in or near moist, humid irrigated cornfields that are attractive for mating and egg-laying. The smaller the distance the moths move before they mate, the greater the chance they’ll mate with other resistant moths from the same field, producing resistant offspring. The shorter the distance the moths move after they mate, the faster the build-up of resistant insect populations in that area.

Three researchers have been involved in this research since 1996: Tom Hunt, Extension entomologist, Haskell Ag Lab, Concord, Leon Higley, NU Department of Entomology, and John Witkowski, District Director, Northeast REC, Norfolk.

Mark-recapture studies, which involve capturing moths that were fed on red or blue dyed diet as larvae at the USDA Corn Insects and Crop Genetics Research Unit at Ames, Iowa, form the core of the research. Researchers place card-

Preemergence herbicides (Continued from page 41)

Most Preemergence herbicides require 0.5 inch or more of rainfall for adequate incorporation. With mechanical incorporation, soil moisture must still be adequate for herbicide uptake and activity.

How long can the herbicide remain on the soil surface before incorporation and still remain adequately active? This depends on several factors, primarily the type of herbicide and weather conditions.

Herbicides such as Prowl are quite volatile and should be incorporated within seven days or activity may be lost. Hot temperatures and high winds may even reduce this time. Many corn preemergence herbicides are chloracetamides such as Dual, Bicep, Harness, etc. These herbicides are much less volatile, having lower vapor pressure constants, and can remain on the soil surface for much greater times without loss of activity. Under cool weather conditions, these herbicides can remain on the soil surface for two or more weeks before incorporation without a significant loss after incorporation. If rainfall has not occurred after the third week, other incorporation measures may be needed. This period will likely be shortened however by temperatures in the 80s and high winds.

For the most part, producers don’t need to worry about incorporating preemergence herbicides directly after application. Remember this when selecting herbicides since some are much better than others with respect to vapor loss or degradation. Choose a herbicide that can remain unincorporated for two or more weeks and hope for rain.

Jeff Rawlinson, Extension Technologist, Weed Science Alex Martin Extension Weed Specialist

Drought update

Much of central and eastern Nebraska, almost all of Iowa, and a large strip of central Illinois and northern Indiana are now considered to be in a severe drought, according to the U.S. Drought Monitor. The Panhandle is about the only part of Nebraska not considered to be abnormally dry or in the drought. For more information, visit the Drought Monitor website at

You’ve already noticed this in the field, but the stats confirm it: soil temperatures across the state are warming up earlier than normal this year. According to readings from NU Agricultural Meteorology stations at 18 sites Thursday morning (April 13) at 4 inches below the surface, temperatures were almost 5 to 10 degrees above normal.
Distinguish weevil type before treating

Reports from central and southern Nebraska indicate that the mild winter has favored survival of overwintering adults and eggs of alfalfa weevils, possibly increasing the potential for weevil damage in 2000. While farms gear up for spring planting, don’t forget to be checking your high quality alfalfa hay for weevils over the four weeks.

Alfalfa weevil activity began in southern Nebraska last week and is likely to reach northern Nebraska this week. Weevil larvae usually begin causing noticeable damage at about 375 growing degree days (48 degree base).

Because of the mild winter more eggs than normal may have survived the winter (a certain percentage of eggs are laid in the fall, although most alfalfa weevils overwinter as adults). This may cause feeding damage earlier than expected. Clover leaf weevil may be a problem this year due to the lack of moisture. They are very vulnerable to a fungus disease and so haven’t been a pest since the late 80s and early 90s. Clover leaf weevil larvae can be found in the debris around the crowns during day. Scratching in the soil around the crowns and counting the number of larvae found per crown will help give a better idea of clover leaf weevil infestation. Their brown heads will help distinguish them from the black headed alfalfa weevil.

Both the alfalfa weevil and clover leaf weevil species feed on first cutting alfalfa as larvae and regrowth of the first cutting as adults. Research in northeast Nebraska has shown that while clover leaf weevil larvae feeding does not cause yield reduction to first cutting alfalfa, alfalfa weevil feeding can cause severe losses to yield and quality of the first cutting. Correctly identifying the pest in your field can help you more accurately determine the need for and kind of treatment. See Table 1 for a comparison of alfalfa and clover leaf weevils.

It is essential that alfalfa fields be monitored for alfalfa weevil feeding now. Damage consists of small holes and interveinal feeding on the newest leaflets near the stem tips. The larvae are small (1/16 to 3/8 inch in length), pale yellowish green, and become a darker green when larger. These legless worms have black heads and a white stripe the length of the back.

The alfalfa weevil larvae spend nearly all their time on the plant. They curl into a “C” shape when disturbed.

Once the alfalfa is about 4-6 inches high, take a bucket, carefully cut some stems at ground level (30 to 50 per field, from various spots in the field) and shake the stems against the side of the bucket. Average the number of weevil larvae per stem. Use the charts to help determine whether control measures are necessary. Each chart has been developed for a different alfalfa value. To treat or re-sample depends on the average number of weevils per stem, the stem length, and the value of the alfalfa. When alfalfa reaches a certain height, it may be more profitable to cut the alfalfa early rather than to treat.

Insecticides registered to control alfalfa weevil larvae include Ambush, Baythroid, Cythion, Furadan, Guthion, Imidan, Lannate, Lorsban, Penncap M, Pounce, Sevin, and Warrior.

Keith Jarvi
Integrated Pest Management
Northeast REC

Table 1. Comparison of alfalfa weevil to clover leaf weevil.

<table>
<thead>
<tr>
<th>Alfalfa weevil</th>
<th>Clover leaf weevil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overwinter primarily as adults</td>
<td>Over winter primarily as larvae</td>
</tr>
<tr>
<td>Adults brown with dark brown</td>
<td>Adults dark brown, pitted light</td>
</tr>
<tr>
<td>stripe halfway down back,</td>
<td>brown underneath, over 1/4 inch</td>
</tr>
<tr>
<td>3/16 inch long</td>
<td>long</td>
</tr>
<tr>
<td>Larvae prefer to feed on tips</td>
<td>Larvae feed anywhere on plant</td>
</tr>
<tr>
<td>Larvae remain on plant</td>
<td>Many larvae in soil or debris</td>
</tr>
<tr>
<td>most of the time</td>
<td>during daytime hours</td>
</tr>
<tr>
<td>Larvae have black heads</td>
<td>Larvae have brown heads</td>
</tr>
<tr>
<td>Adults leave fields in June</td>
<td>Adults may remain in fields</td>
</tr>
</tbody>
</table>
### Alfalfa weevil treatment thresholds

**Table 2. Pesticides for control of alfalfa weevil. (R=Restricted use product)**

<table>
<thead>
<tr>
<th>Product Name (formulation/acre)</th>
<th>Chemical Name</th>
<th>Rate</th>
<th>Restrictions/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>R Ambush 2 E, 25 Wor 25 W WP</td>
<td>permethrin</td>
<td>6.4-12.8 oz</td>
<td>At 6.4 oz, no preharvest interval. Over 6.4 oz, preharvest interval of 14 days.</td>
</tr>
<tr>
<td>R Baythroid 2</td>
<td>cyfluthrin</td>
<td>1.6-2.8 oz</td>
<td>Preharvest interval of 7 days.</td>
</tr>
<tr>
<td>Cythion 5</td>
<td>malathion</td>
<td>1.5-2.0 pts</td>
<td>No preharvest interval.</td>
</tr>
<tr>
<td>Cythion 8</td>
<td>malathion</td>
<td>1.25-1.5 pts</td>
<td>No preharvest interval.</td>
</tr>
<tr>
<td>R Furadan 4 F</td>
<td>carbofuran</td>
<td>0.5-2.0 pts</td>
<td>At 0.5 pts, preharvest interval of 7 days. At 1.0 pt, preharvest interval of 14 days. At 2.0 pts, preharvest interval of 28 days. At 0.66-1.0 pt, preharvest interval of 14 days. At 1.0-1.3 pts, preharvest interval of 16 days. Over 1.3 pts, preharvest interval of 21 days.</td>
</tr>
<tr>
<td>R Guthion 3</td>
<td>azinphos-methyl</td>
<td>0.66-2.0 pts</td>
<td>For grazing or feed, wait 7 days.</td>
</tr>
<tr>
<td>Imidan 70-WSB</td>
<td>phosmet</td>
<td>1.3 lbs</td>
<td>Preharvest interval of 7 days.</td>
</tr>
<tr>
<td>R Lannate LV</td>
<td>methomyl</td>
<td>1.0 lb</td>
<td>No preharvest interval. For grazing or feed, wait 7 days.</td>
</tr>
<tr>
<td>R Lannate SP</td>
<td>methomyl</td>
<td>1.0-2.0 pts</td>
<td>Preharvest interval of 14 days. Over 1.0 pint, preharvest interval of 21 days.</td>
</tr>
<tr>
<td>Lorsban 4 E</td>
<td>chlorpyrifos</td>
<td>1.0-2.0 pts</td>
<td>Preharvest interval of 7 days.</td>
</tr>
<tr>
<td>Malathion 57 EC</td>
<td>malathion</td>
<td>1.5-2.25 pts</td>
<td>No preharvest interval.</td>
</tr>
<tr>
<td>R Methyl Parathion 4 E</td>
<td>methyl parathion</td>
<td>0.5-1.0 pt</td>
<td>Preharvest interval of 15 days.</td>
</tr>
<tr>
<td>R Penncap-M</td>
<td>methyl parathion</td>
<td>2-3 pts</td>
<td>Preharvest interval of 15 days.</td>
</tr>
<tr>
<td>R Pounce 3.2 E</td>
<td>permethrin</td>
<td>4-8 oz</td>
<td>At 4 oz, no preharvest interval. Over 4 oz, preharvest interval of 14 days.</td>
</tr>
<tr>
<td>R Pounce 25 WP</td>
<td>permethrin</td>
<td>6.4-12.8 oz</td>
<td>At 6.4 oz, no preharvest interval. Over 6.4 oz, preharvest interval of 14 days. At 0.1 lb, no preharvest interval. Over 0.1 lb, preharvest interval of 14 days.</td>
</tr>
<tr>
<td>R Pounce WSB</td>
<td>permethrin</td>
<td>0.1-0.2 lb</td>
<td>Preharvest interval of 7 days.</td>
</tr>
<tr>
<td>Sevin 4 F, XLR</td>
<td>carbaryl</td>
<td>1.5 qts</td>
<td>Preharvest interval of 7 days.</td>
</tr>
<tr>
<td>Sevin 50 W</td>
<td>carbaryl</td>
<td>3 lbs</td>
<td>Preharvest interval of 7 days.</td>
</tr>
<tr>
<td>Sevin 80 WSP, 80 S</td>
<td>carbaryl</td>
<td>1.88 lbs</td>
<td>Preharvest interval of 7 days.</td>
</tr>
<tr>
<td>R Warrior-T</td>
<td>lambda-cyhalothrin</td>
<td>2.56-3.84 oz</td>
<td>Preharvest interval of 1 day for forage, 7 days for hay.</td>
</tr>
</tbody>
</table>
Preemergence weed management strategies in corn using herbicide resistant crops

Producers are currently debating whether to apply an early preplant or preemergence herbicide treatment to compliment their corn weed management. Many questions have arisen over the last few weeks as to the type of preemergence treatment necessary with herbicide resistant crops. Here are some guidelines that may help with this decision process.

**Know your fields**

Perhaps the best weapon against yield robbing weed infestations is thoroughly knowing your fields. This means having good knowledge of the types of weeds present each year with different crops, their densities, where they are located within the field and what parts of the year they are most problematic.

Many producers will benefit from season-long scouting. This allows the producer to observe different weed species throughout the growing season, enabling management changes to be made if necessary. Producers who have already established a good scouting program will be in a better situation to determine what weed management strategies will work for them.

**Herbicide resistant crops**

Currently, there are several herbicide tolerant corn varieties including Clearfield corn, PP corn, Liberty Link corn, and Roundup Ready corn. Of these, Liberty Link and Roundup Ready are genetically engineered.

The concept of herbicide resistant crops is based on using a resistant crop variety so that a particular herbicide can be used in enough quantity to provide very good weed control. History has shown us that, based on the particular scenario, herbicide resistant crops have provided consistent weed control without crop injury. This allows a bit more flexibility with your overall weed management plan. HRC’s really shine in fields of heavy weed infestations or fields with differing degrees of resistant weed species.

**Strategies**

Utilizing herbicide tolerant crops should provide some added benefit to the user. Of course, the most obvious benefit is better control of specific weeds with greater crop safety than conventional herbicides. Producers can also use HRC’s to benefit their overall management.

The use of reduced rate preemergence herbicides has received a lot of attention in the last few years. This is in large part due to HRC’s. Research at the University of Nebraska, in Clay Center, has shown that a reduced rate of Harness Xtra at 1.3 qt/a followed by Roundup Ultra can provide weed control similar to a full rate of Harness Xtra. Yields were also similar. Of course, reduced rates alone are risky and the user has no recourse with the herbicide company for poor weed control. In a drought year, one might look closely at reduced rates of a preemergence herbicide followed by a postemergence herbicide, possibly benefiting from not putting all your eggs in one basket.

Another strategy when using HRC’s is to use a less expensive preemergence herbicide followed by the postemergence treatment. Preemergence herbicides for this use include primarily atrazine. At $6.50/a, atrazine provides good weed control, especially when followed by Roundup Ultra or Liberty herbicide.

Of course, the safest strategy is a good preemergence herbicide such as Bicep II Magnum, Harness Xtra, Dual II Magnum, Balance, Axiom, etc. followed by a strong postemergence herbicide. This will provide the most flexibility for season long weed control. However, these treatments are not cheap and depending on the amount of precipitation that falls in the next few weeks, these treatments may not be able to provide the high degree of control we are accustomed to.

The bottom line is that HRC’s do allow producers to possibly save money in their preemergence weed management while still allowing for excellent weed control comparable to the $30+/a treatments. However, using some techniques will void any warranty from the manufacturer and definitely increase the risk of poor performance. When used properly, lower cost weed management scenarios can be had with HRC’s, as long as we do not ask too much of any one treatment.

Jeff Rawlinson
Extension Technologist
Alex Martin
Extension Weed Specialist

**Briefs**

(Continued from page 42) wheat stands are weak, mostly due to poor germination last fall. The cool season grass has been frozen off at least three times, which will reduce spring grass growth.

Ray Weed, Extension educator in Kimball and Banner counties: Some winter wheat fields in northern Banner county are showing signs of moisture stress. Stress level varies widely from none to severe. There are a few bird-cherry oat aphids present as well, but they don’t appear to be much of a problem right now.

The threat from Russian wheat aphids in Kimball and Banner counties may be increasing. Aphid levels are increasing in northeastern Colorado and limited numbers have already been seen in Nebraska.
Managing your weed control strategy to avoid resistance development

Resistance takes only a few years to achieve, but many more to remediate. Preventing resistance is by far better than dealing with it each year.

For many producers, controlling herbicide resistant weeds is the most frustrating aspect of their management. In many cases it has required them to change their farm operations. Sometimes these changes may represent definite improvements, while other times, they may just represent very costly band aids for problems which might have been avoided.

Herbicide resistant weeds

Several weed species have developed resistant populations in Nebraska including shattercane, waterhemp, kochia, lambsquarter, and pigweed. Resistance implies that something occurred over time causing a population to become tolerant to a particular class of herbicides. Often the cause is repeated use of the same class of herbicide in the same field. These weed species, which may slowly develop a resistance to the herbicide, will proliferate over time due to selection pressure. Resistance is not the same as tolerance. A species may be naturally tolerant to a specific herbicide from day one. Resistance is also a part of the biology of the herbicide.

Obviously, some plant species are much more prone to developing herbicide resistance than others. For example, waterhemp and pigweed are very similar and belong to the Amaranth family. However, waterhemp is much more likely to develop resistance due to its reproductive biology. Waterhemp is dioecious, meaning it has separate male and female plants. This plant relies on cross-pollination for reproduction. Pigweed is monoeious and for the most part is self-pollinating. This means if a waterhemp plant develops resistance in a field, it will likely pass that resistance to many nearby plants. The pigweed plant is more likely to pollinate itself, reducing the spread of resistance. After finding resistant weeds in a field, you can choose to increase the problem or deal with it.

Choosing a strategy

When choosing a weed management strategy for fields containing resistant weed species, focus on the resistant weeds. The object should be to prevent any one species from consistently going to seed. Understanding the resistance and mode of action of the herbicides being used will be helpful. Rotating the modes of action of various herbicides is a good strategy for any field because it can help limit the development of herbicide resistant weeds; however, it's important to understand the modes of action for various herbicides. For example, if ALS resistant waterhemp has plagued a field, rotating from Python to Broadstrike will do little to control the resistant species. Rotating to another ALS herbicide such as Pursuit the following season in soybeans will also increase resistance (Table 1). One would have to rotate to either Balance or Axiom to achieve control. Likewise, if ALS resistance is the problem, you will need to rotate to a herbicide with an active ingredient that is not an ALS inhibitor, and has activity on the resistant weed. The following table lists current resistant weed species found in Nebraska and the preemergence corn herbicides that will not give adequate control due to resistance.

Some producers in Nebraska have cross resistance where the weed species is resistant to more

(Continued on page 48)
Spartan receives Section 18 for minimum till sunflowers

Spartan herbicide by FMC has been granted a Section 18 exemption this year for sunflowers grown in conservation tillage systems in Nebraska.

Spartan herbicide has provided excellent control of troublesome broadleaf weeds, such as kochia, Russian thistle, and pigweed species in no-till sunflower research plots for the past several years.

It has been difficult to consistently achieve a high level of broadleaf weed control in sunflower without herbicide incorporation. Spartan herbicide has changed that. It has a much greater water solubility than Prowl, primarily a grass herbicide, and requires much less precipitation to move the herbicide into the soil. Spartan herbicide does not photodegrade at the soil surface, so it can wait longer than Prowl for an incorporating rain. While Spartan herbicide provides excellent broadleaf weed control and has some activity on grass weeds, Spartan should be tank-mixed with Prowl herbicide at labeled rates for control of many of the grass weeds.

Some crop injury was reported from Spartan herbicide used in production fields in 1999, when it also received a special Section 18 exemption. The injury was typically restricted to high pH, low organic matter soils on hilltops. The injury consisted of leaf chlorosis, plant stunting, and occasionally plant death. Injured plants generally grew out of the injury within a few weeks and yield differences were minimal at harvest. The Spartan label for 2000 recommends lower use rates on soils with higher risk for crop injury.

Early preplant applications also have been shown to reduce crop injury with Spartan herbicide and may be a good option for no-till sunflower production in many areas. The late approval of Spartan for use in 1999 limited use of early preplant applications. Spartan herbicide has a long soil residual, which maintains in-crop weed control with early preplant applications up to 30 days prior to planting. Slightly increased rates of Spartan herbicide may be needed with early preplant treatments, especially when applied more than 20 days before planting.

Recropping intervals include: anytime for soybeans; 4 months for wheat, barley, rye, oats and triticale; 10 months for field corn and sorghum; 12 months for proso and pearl millet; and 18 months for sweet corn.

Follow all label directions. Applicators wishing to apply Spartan herbicide in sunflower must have a permit issued by the Nebraska Department of Agriculture and must possess a copy of the Section 18 label at the time of application.

Drew Lyon
Extension Dryland Cropping Systems Specialist, Scottsbluff
Robert Klein
Extension Cropping Systems Specialist, North Platte

USDA history, photo resources available on-line

The USDA has established several archives of their vast resources which may be of interest to the ag community. One site features historical U.S. agriculture documents and the second features more than 20,000 USDA photos which are available for the public's use.


It includes original letters, reports, and other papers of USDA officials and other materials. Some date back to the late 18th century.

The USDA Online Photography Center contains more than 20,000 images related to agriculture, including 45 of corn. It's at http://www.usda.gov/oc/photo/opclibra.htm.

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Managing weeds (Continued from page 47)

than one mode of action. For example, ALS and triazine resistant waterhemp is common in southeast and south central Nebraska. In this case, an alternate herbicide should not use either the ALS inhibition or the triazine mode of action. In this case, a growth regulator herbicide such as Clarity, Distinct, 2,4-D, etc., would be a good choice. In the preemergence category, shoot inhibitors such as acetochlor, the active ingredient in harness and Fultime, provide good control.

To select the right herbicide for your weed control needs, it's important to understand about the herbicide’s active ingredient and mode of action to avoid contributing to a resistance development. Also, keep good records to make it easier to rotate mode of action each year. Resistance takes only a few years to achieve, but many more to remediate. Preventing resistance is by far better than dealing with it each year.

Jeff Rawlinson
Extension Technologist
Alex Martin
Extension Weed Specialist