

*North Central Ohio  
Agronomy Report  
Erie Basin Extension Education & Research Area  
Issue 16-09*



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Dear Agricultural Producer:

Corn, soybean, and wheat yields were perhaps the highest in recorded history in many areas of North Central Ohio. When we combine record yields and excellent prices, we indeed have much to be thankful for as we end 2009.

OSU Corn and Soybean performance trial data are available at:

<http://www.oardc.ohio-state.edu/soy2008/>  
<http://www.oardc.ohio-state.edu/corntrials/>

Review the calendar of events for agronomy, farm management and PAT educational sessions in 2010.

Best regards,

*Steve*

Steven C. Prochaska, Ph.D.  
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Associate Professor, OSU Extension, Erie Basin EERA

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(Also, we thank **Howard Siegrist** for his aid with this newsletter)

<http://agcrops.osu.edu>

<http://www.oardc.ohio-state.edu/ohiofieldcropdisease>

<http://www.ipm.iastate.edu>

<http://fcn.agonomy.psu.edu/farm>

<http://precisionage.osu.edu>

<http://www.ipm.uiuc.edu/bulletin>

<http://www.entim.purdue.edu/Entomology/ext/targets/newslett.htm>

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*Keith L. Smith, PhD., Associate Vice President for Agricultural Administration and Director,  
Ohio State University Extension TDD No. 800-589-8292 (Ohio only) or  
614-292-1868*

# **North Central Ohio Agronomy Report**

## **Soil Management and Environment Website Launched by Extension**

Mahdi Al-Kaisi, Associate Professor, Agronomy Department  
Iowa State University Extension

Iowa State University Extension soil management and environment information can now be found on a new website [www.agronext.iastate.edu/smse](http://www.agronext.iastate.edu/smse). The Soil Management/Environment website replaces the Soil Management and Conservation Practices website. It contains information that is useful to producers, agriculture business, and scientists.

Website content is based on past and current extension and research projects on tillage and cropping systems, soil carbon, residue management, and cover crops. ISU Extension publications, newsletter articles, refereed journal articles, and relevant links are listed under each area of interest. Descriptions of the most current projects are also included.

Several management tools are available, including residue and erosion calculators and other decision-making tools. The materials on this website are intended for public use and educational and research purposes with proper credit to the authors and Iowa State University Agronomy Extension. We welcome any feedback on the new format so continued improvements to the dissemination of our extension and research programs to the agricultural community in Iowa and elsewhere can be made.

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## **Herculex and Western Bean Cutworm – No Silver Bullet**

Tracey Baute, Field Crop Entomologist/OMAFRA Ridgetown  
Ministry of Agriculture Food & Rural Affairs – Ontario, Canada

Currently, Herculex Bt corn is the only transgenic option registered for control against western Bean cutworm (WBC) and although it works very well it does not provide 100% control. Does every grower in the province need Herculex Bt? I do not think that every grower in Ontario needs to plant Herculex next year to protect themselves from WBC since we have not had one case yet where a field has reached economic levels of WBC in Ontario.

As with life there are no certainties and the same holds true for WBC control. If you plant Herculex Bt corn specifically to control WBC, don't be surprised to see some damage late in the season. Keep this in mind if you are expecting or promised 100% control. We are all familiar with how successful Bt corn (whether YieldGard or Herculex) has been at controlling European corn borer (ECB) but remember WBC is a different pest. Control of ECB is nearly 100% with plants and ears being completely clean of ECB feeding. It is so good that scouting Bt corn fields has not really been high on people's priority list of things to do each year. This is not the case with western bean cutworm control. You will experience some feeding and in heavier infestations a spray may still be necessary.

A case in point. A field plot in southwestern Ontario that I was in this summer had a light to moderate WBC infestation. It still was not a case where a spray should have been applied (i.e. damage was not at economic levels), but there were one larva per ear in a few hot spots of the plot. The majority of the WBC feeding was at the ear tip. This was nothing like the injury I saw in Michigan last year where there were several larvae per ear and the feeding was extensive throughout the ear. In fact, we have not reached that kind of feeding damage yet in Ontario. In this particular Ontario plot, there were strips of non-Bt hybrids, YieldGard hybrids and Herculex hybrids. It was clear from the start that the Herculex hybrids had fewer infested ears compared with the non Bt and the YieldGard plants. But there were still some ears that resembled the same amount of feeding damage as the non Bt and YieldGard ears (Figure 1). To ensure that these damaged ears were from Herculex plants and not off types, I ran Bt kits specific for Cry1F on the kernels and found that yes indeed, these ears were expressing the Cry1F (found in Herculex Bt) toxin (Figure 2).

This is not a surprise for those who work on western bean cutworm. Research has shown that Herculex Bt corn does experience less damage than non-Bt corn or YieldGard corn, the level of control by Herculex Bt corn ranges somewhere between 70 to 90%. Don't get me wrong. I am relieved that we have Herculex Bt corn available to help manage WBC but like

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this case demonstrated, it is not going to be a silver bullet. This means that we will still need to be very active at scouting even Herculex fields to assess infestations, feeding damage and the development of ear rot. And keep in mind that the 20% non-Bt refuge required for Herculex 1 or Herculex Xtra BT corn will be unprotected and will need to still be scouted and managed if necessary.

"Protection" is a strong term to use if you equate it to full control and clean ears. As long as you think of it more as "protection from what the damage could have been if you hadn't used Herculex", then you are more apt to be content with the control. But again, Ontario has not yet experienced heavy infestations that required us to manage WBC. Some fields in hot spot areas of the province may experience economic damage next year but province wide use of a product to control WBC in 2010 may be premature.



Figure 1. Corn ears with WBC feeding damage in field plot in southwestern Ontario – YieldGard.



Figure 2. Corn ears with WBC feeding damage in field plot in southwestern Ontario –Herculex.



Figure 3. Example of ear taken back to the lab to test the kernels for Cry 1F. Ear tested positive for Cry1F (Herculex).

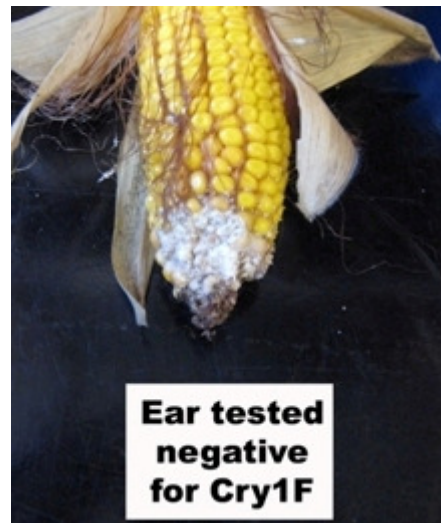


Figure 4. Example of ears taken back to the lab to test the kernels for Cry1F. Ear tested negative (did not contain Cry1F Bt.)

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## Shifting from Corn Drying to Corn Storage

Dirk E. Maier, Agricultural Engineering  
Purdue University Extension

As the harvest is finally beginning to wind down, it is time for farmers and elevator managers to shift their attention from drying the corn crop to storing it. Proper storage management, and deciding when to move the grain for sale, will be especially critical this year, since the storage quality of the crop has certainly been compromised.

Problems that may lead to hot spots and mold development in the bin include:

- High harvest moisture contents, which have led to non-uniform and incomplete moisture removal during drying.
- Excess trash and fines that were generated by shelling the wetter than normal corn.
- High drying temperatures that have increased breakage susceptibility.

Other factors contributing to potential storage problems are:

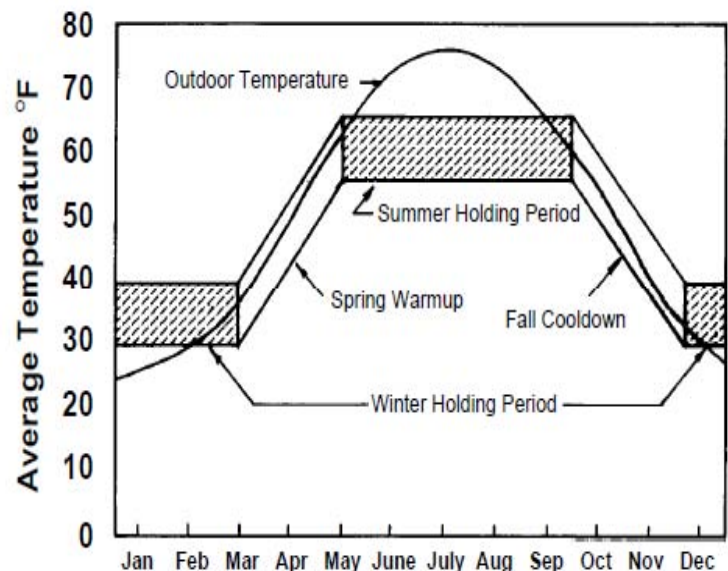
- The lateness of the harvest, which has caused a bottleneck in drying and cooling operations; thus, much of the corn may not have been dried enough for safe storage.
- High yields, which have caused overfilling of grain bins and piling of corn in outdoor piles, both of which should be used only as temporary storage solutions.

**Safe Storage Temperature:** Most storage problems result from improperly cooling the grain in the storage bin. The most common mistake is to stop running the aeration fan before the cooling front has moved through the entire grain pile. This can lead to condensation and crusted layers of spoiled grain in the bulk.

Four separate storage management periods can be distinguished and are illustrated in the diagram :

- 1) fall cooldown
- 2) winter holding
- 3) spring rewarming, and
- 4) summer holding

Farmers and elevator managers should have completed the fall cooldown for much of this year's corn crop by now, and be at the start of the winter holding period. For winter storage in Indiana, the grain should be cooled to 35-40° F before the end of December. An aeration cycle can be started when the average daily temperature is 10-15° F cooler than the grain temperature. For example, if the high and low daily temperatures are 40° and 30° F, respectively, the average temperature is about 35° F. Thus, if the grain temperature is above 45° F, the aeration cycle should be started.



**Aeration Cooling Time:** The fan operating time depends solely on the airflow rate in the storage bin. An aeration fan is usually sized for about 1/10 cfm/bu, while an in-bin drying fan is usually sized for 1 cfm/bu. It is very important to recognize the difference in order to operate the fans long enough to move the cooling front completely through the bulk, and yet not so long as to waste electricity. The following table summarizes the approximate times for the last cooling cycle before the winter holding period for a range of common airflow rates.

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**Turning the Fan Off:** With low airflow rates (up to 3/4 cfm/bu), the fans can be run continuously even if high humidity persists for a day or two. Any rewetting is minimal and is offset by good weather periods. With higher airflow rates (above 3/4 cfm/bu) the cooling cycle is short enough that the fan can be shut off to avoid high-humidity air.

If air is pushed through the grain, temperatures should be checked about 1 foot into the upper surface in several locations to confirm that the cooling front has moved completely through before the fan is shut off. If air is pulled through the grain, the air temperature should be measured in the duct before it is exhausted by the fan.

**Additional Management Tips:** Before initiating the last aeration cooling cycle for winter storage, the grain surface should be leveled. This will assure more uniform airflow through the entire bulk and prevent the development of hot spots in the peaked grain. If no grain spreader was used to fill the bin, a core should be drawn first. Removing the core will take out much of the fines accumulated below the spout and will significantly reduce spoilage potential. For bins that are overly full, corn should be withdrawn for feed or sale. These bins can otherwise not be properly aerated, leveled, and monitored during the storage season.

Airflow rate, cfm/bu	Cooling time, hours
1/20	400
1/10	200
1/4	80
1/2	40
3/4	27
1	20
1 5	13

Finally, upon completion of the cooling cycle, each of the aeration fans should be sealed by covering it with a tarp, plastic sheet, or board. This will prevent air from being drawn into the bin causing moisture migration, as well as help keep insects and rodents out. Roof fans and vents must be left uncovered, however. Remember that grain quality can never be improved during storage.

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### Managing Grain for Year-Round Storage

G. H. Foster and B. A. McKenzie, Agricultural Engineering Department  
Purdue University

Right 'actions' taken as grain first goes into on-farm storage and then throughout the storage period will minimize the chance of problems that necessitate expensive 'reactions'.

Grain has a limited storage life. If most of this life is used up during the fall and winter, the grain may not make it through the following summer. There are basic management practices, however, that can prolong this storage life. Attention to these practices should help insure successful grain storage the year around.

This publication discusses the types of 'actions' needed for year-round storage. They involve the proper condition of the grain at bin-filling, correct design and operation of the aeration system, and other suggestions to prevent trouble. Although the discussion here deals specifically with corn, the principles apply to most feed and cereal grain, unless otherwise noted.

**PROPER CONDITION AND MOISTURE OF GRAIN FOR STORAGE:** Grain stores best if it is dry, cool and clean. Grain must be dry to hold it through the summer months. Cooling can sometimes replace drying, as when moist grain is held through the winter. And grain that is clean will better resist mold growth and insect infestation even if stored at 1-2 percent higher moisture content than will grain that is 'dirty' (i.e., containing a lot of broken kernels, chaff and foreign material).

Clean, undamaged shelled corn, properly cooled and managed, will keep for one year at 14 percent moisture. Corn mechanically damaged or dried at temperatures above 140° F or containing more than a trace of broken kernels and fines, should be dried down 1-2 percent tower than clean corn. Corn properly cooled can be held at up to 15-16 percent moisture through the winter if it is to be sold, fed or dried down further before April 1

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(March 15 in southern Indiana).

**AERATION TO MAINTAIN GRAIN IN STORAGE:** To maximize storage life and prevent moisture migration and buildup, grain should be held at near-average outdoor temperatures. The technique now used almost exclusively to control and maintain these desired grain temperatures is aeration, which merely mechanical ventilation of grain in storage.

**Aeration--A Little History:** Aeration dates back only to the post World War II years. It developed at a time when grain surpluses were increasing, storage of these surpluses for periods of more than a year was common, and larger bins or flat storages were coming into use to cut costs.

Aeration received a further boost with the advent of field shelling and increased use of heated-air dryers for corn. This artificially-dried corn was much more brittle than that dried naturally in cribs or bins. So when it was 'turned' (moved from bin to bin to equalize temperatures), excessive breakage resulted. To eliminate this moving or handling of the grain, turning gave way to aeration.

Aeration itself is no guarantee that storage problems are over. But if properly practiced, it can overcome most of the potential difficulties.

**Why Aeration Is Necessary In On-Farm Bulk Grain Storage:** In bins over 2000 bushels capacity, the grain bulk or mass is so large that it fails to cool uniformly enough to avoid storage problems as outdoor temperatures change with the seasons. The unequal temperature in the grain mass then causes air current to circulate from warm to cold grain.

Since warm air holds more moisture than cold, the air moving up through the warm grain center picks up a full load of moisture, depositing some as it moves through the cold grain in the top layer. This causes moisture buildup, molding and crusting. These minute "convection currents" in the grain cause moisture migration and accumulation that can only be prevented by reducing temperature difference in the grain bulk.

**Table 1. Fan Horsepower to Aerate Various Depths of Stored Shelled Corn at Five Different Airflow Rates.**

corn depth ft.	Aeration airflow rates per bushel				
	1/10 cfm	1/4 cfm	1/2 cfm	3/4 cfm	1 cfm
	horsepower/100 sq. ft.*				
10	.015	.04	.10	.19	.31
15	.025	.06	.24	.54	1.00
20	.034	.10	.48	1.20	2.30
25	.050	.21	1.00	2.30	4.30
30	.070	.36	1.70	4.30	
40	.140	.83	4.30		
50	.260	1.60	8.80		

\*Fan horsepower per 100 sq. ft. of bin floor or cross-sectional area.

**Table 2. Determining Fan Horsepower Requirements for Aerating Shelled Corn In Bins of Various Diameters and Depths of Fill.**

Bin di- ameter ft.	Floor area sq.ft.	Multi- plier		Hp value from Table 1	Fan hp for bin
18	250	2.5	x	_____	_____
21	346	3.5	x	_____	_____
24	452	4.5	x	_____	_____
27	572	5.7	x	_____	_____
30	706	7.1	x	_____	_____
33	855	8.6	x	_____	_____
36	1017	10.2	x	_____	_____
40	1256	12.5	x	_____	_____
42	1385	13.9	x	_____	_____
48	1808	18.1	x	_____	_____

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Basically uniform temperatures can be maintained in aerated grain storage if the aeration system has been well designed and is properly operated.

**PROPER DESIGN OF THE GRAIN AERATION SYSTEM:** The first essential to successful grain aeration is an adequate, well-designed system. There are four basic requirements, and these are reviewed briefly in the following paragraphs.

**\*Provide a minimum of 1/10 cubic foot per minute (cfm) of air for each bushel aerated.**

This means a 10,000-bushel bin requires a minimum of 1000 cfm of air. Tables 1 and 2 provide the necessary data for calculating fan horsepower to aerate shelled corn in bins of various diameters and depths of fill. Aeration fans sized for shelled corn are also adequate for soybeans but not for wheat.

**\*Make the duct connecting the fan to either the distribution ducts or perforated floor large enough that air velocity does not exceed 1500 feet per minute (fpm).**

If a perforated duct system or partial aeration floor (strips, squares or circles of perforated surface) is used to distribute the air under a grain mass, the air passage area from the fan into these ducts or floor segments must be sized to keep air velocity at or below 1500 fpm.

To provide the 1000 cfm airflow rate in the example given above, a duct cross section of 0.67 square feet is required ( $1000 \text{ cfm} \div 1500 \text{ fpm}$ ). This would be achieved using a 12-inch round duct or a 10-inch by 10-inch (or equivalent) square duct.

**\* Provide a full, false, perforated floor or enough perforated duct surface area so that air enters the grain (or leaves, in the case of a suction system) at a velocity no greater than 30 fpm.**

This is one of the most important, yet most frequently overlooked requirements in aeration system design. To determine needed perforated duct surface area to maintain entering air velocity at or below 30 fpm, divide total bin cfm (total bushels x cfm per bushel) by 30 fpm. Using the previous example,  $10,000 \text{ bu.} \times 1/10 \text{ cfm/bu.} = 1000 \text{ cfm} \div 30 \text{ fpm} = 33 \text{ sq. ft.}$  of perforated duct surface required.

To figure the total area that your system presently provides, simply total up the square feet of each area where the air moves from duct into grain (if a full round, perforated duct that lies directly on the bin floor is used, only 80 percent of the perforated surface can be considered for air discharge.). This should include both perforated duct surface and any open areas formed by blocking the duct up off the floor or by leaving the end of the duct open.

**\* In flat storage buildings or large-diameter bins, arrange the perforated duct system so distance between ducts does not exceed depth of grain.**

In addition, the distance from the nearest duct to the wall should not exceed half the depth of the grain.

**PROPER OPERATION OF THE GRAIN AERATION SYSTEM:** Proper operation (or management) of grain aeration systems is as important as good design. Here are the basic management practices that, if applied, should minimize grain storage problems.

**\* Operate the fan long enough to uniformly cool all of the grain in the bin.**

There are two important things to remember relative to grain aeration: (1) it takes a lot of time to cool (or warm) grain at the low airflow rates used for aeration; and (2) grain cools by layers or zones progressing in the direction of air flow.

In other words, a few hours of fan operation on a cold day will not cool all the grain a few degrees. Rather, the

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layer of grain near the air entrance will be cooled to a temperature close to that of the cold air. But if aeration is not continued, temperature differences between the cooled layer and the rest of the grain may be greater than if the fan had not been run at all.

At the minimum recommended airflow rate of 1/10 cfm per bushel, about 160 hours (nearly a week!) of continuous fan operation is required to uniformly cool the grain. At higher airflow rates, the fan operation time can be proportionately shorter; at lower rates, the time is longer.

**\* Aerate as soon as possible after binning to remove harvest or dryer heat and to reduce grain temperature to below 60° F.**

Immediate aeration is especially important under two circumstances: (1) if the grain was binned during hot weather and its temperature is above the average day-night outdoor temperature for that time of year; or (2) if it was artificially dried at high temperature.

Even though the dried grain is cooled before binning, it is still probably 10-15 degrees above the air temperature. On a sunny October afternoon, that may be 85-90°F, which is much too warm for storage.

**\* In late fall, run the aeration fan for a week or until all the grain is at a temperature between 30° and 40° F, then not again (except briefly for periodic grain inspection) until spring unless trouble develop.**

Since one objective of aeration is to keep the grain within a few degrees of normal average outdoor temperatures, aerate in late November or early December to reduce its temperature to near wintertime norms. But be careful not to freeze the grain, especially if it's to be carried into the next summer.

It is true that cold grain keeps better than warm grain; but frozen grain can cause problems when aeration is used to warm it. Also, very cold grain will sweat and may become musty when unloaded in warm, humid weather if not first warmed in the bin.

Some operators run their aeration fans for an hour or so every other week during the winter to check on grain condition. By smelling the air and feeling its temperature, trouble can be spotted early.

**\* In March or April, warm the grain to about 50°F by aerating, if it is to be stored into late summer.**

This is a controversial practice. Some operators prefer to leave the grain at 30-40° F as long as possible. However, if the grain is stored into late summer, reverse moisture migration may cause moisture to accumulate between the warm grain on the surface and the cold grain toward the center of the bin. The trouble spots usually develop 2-3 feet below the grain surface.

Moisture migration and accumulation in summer usually proceeds slower than that which occurs on the grain surface during cold weather. Thus, it may not cause molding and heating until July or early August. If the grain is likely to be stored beyond July 1, then it should be warmed in mid-spring to near outdoor temperatures.

\* Once aeration in the spring is started, continue it until all the grain is warmed uniformly to near outdoor temperatures.

Once begun, if fan operation is stopped for any length of time, there will be a zone of condensed moisture in the cold grain at the point where the warming front had reached. Conditions in this zone would be ideal for rapid mold development. If aeration is continued, however, the wet grain will be warmed and the moisture evaporated before the grain can deteriorate.

\* Do not aerate in the summer unless trouble develops.

Summer aeration is not recommended unless 'hot spots' or other trouble develops in the grain. Aeration fans can be run occasionally in the summer to check grain condition, but for less than an hour at a time.

### **OTHER GRAIN STORAGE MANAGEMENT SUGGESTIONS**

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**Covering Fans Not in Use:** It is a good idea to cover the fan when not operating. This prevents the possibility of excessive grain cooling in winter or rapid warming in summer from air that will move through the fan opening.

Outside wind pressure combined with a 'chimney effect' in the bin can cause substantial air movement through the grain. Covers will eliminate this as well as help keep rodents and insects out of the bin plenum and duct systems.

**Insect Control:** If insect problems show up in the grain prior to mid-August, the bin should be fumigated. Light infestations appearing after mid-August can probably be controlled by aeration cooling.

Insects develop very slowly at temperatures below 60° F, and will become dormant or die out in extended storage periods of 35°F or below. But remember, if insects are only dormant, they will be in the marketing sample and become active as soon as the sample warms. Fumigation may be required to market grain free of live insects.

An emptied storage bin should always be swept clean of dust and old grain before refilling. It is also recommended that both the inside surface and surrounding ground area be treated with an approved residual insecticide spray.

It is not a good practice to add new grain on top of old in a storage. If absolutely necessary, then fumigate the entire storage immediately following the addition.

**Filling (and Refilling) the Bin:** Do not fill a bin to a peak or until the grain touches the roof. This will interfere with uniform air flow and prevent moisture movement out of the grain surface. Level fills work best!

**Regular Inspection:** The grain surface should be inspected at least every other week throughout the storage period. To make an inspection, walk over the grain and poke around with your arm or a rod, smelling, feeling and looking for indications of trouble.

Evidences of hot spots, insect infestations or other problems that start in the grain mass soon migrate to the surface. Hot spots will be seen as damp, warm, musty areas. Insects and mold growth are more likely to show up where broken corn has accumulated.

**A WORD ABOUT GRAIN HANDLING SAFETY:** Wear a surgical-type disposable mask when working around moldy or spoiled grain. Exposure to and inhaling mold can cause severe allergic reactions.

Never enter a bin when grain is being unloaded. In flowing grain, you have only 2-4 seconds before you are helpless, even at modest 6-inch auger flow rates.

Also, beware of crusted grain. It not only is likely to be moldy, but it also may be concealing large cavities where grain has been removed below the crust. Anyone Stepping on that crust may plunge through and be covered with grain, even if the unloading equipment is not operating.

Grain suffocation accidents do happen, and all too often! Think before you move. Safety must be an action, not a reaction!

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# *North Central Ohio Agronomy Report*

## New Herbicide Update for Corn, Soybeans, and Wheat

Mark Loux, Weed Specialist  
Ohio State University Extension

A number of new products for corn, soybeans, and wheat have been made available to Ohio growers over the past year. Some of these were used on a limited basis in 2009, but 2010 will be the first year of widespread use for most. As in previous years, some new products are simply new premix formulations of existing products (Flexstar GT, for example), but two brand new active ingredients were also registered. These include saflufenacil, the basis for the Kixor family of products, and thien carbazon-methyl, which is a component of Corvus and Capreno. The 2010 Weed Control Guide for Ohio and Indiana contains information on all of the products discussed here. The 2010 guide is available in pdf format on our website, <http://agcrops.osu.edu/weeds>, and the print version should be available in early December. This information can possibly make it easier to wade through and interpret the marketing blitz that is in progress for some new products.

### **Corn Products**

**Kixor Based Products** Kixor is the overall name for saflufenacil-based herbicide technology. BASF has introduced three new products based on the active ingredient, saflufenacil, a broad-spectrum broadleaf weed herbicide. The three new products include: Integrity, a premix of dimethenamid (Outlook) and saflufenacil for field corn and popcorn; Sharpen, which contains just saflufenacil and is labeled for corn, soybeans, and wheat; and Optill, a premix of saflufenacil and imazethapyr (Pursuit) for soybeans. Saflufenacil represents novel herbicide chemistry, but not a new herbicide site of action. It is a PPO inhibitor (group 14), the same site of action as Valor, Authority, Cobra, and Flexstar, among others.

Saflufenacil products are labeled for preplant or preemergence use only, and provide residual control of most annual broadleaf weeds at the rates that can be used in corn. The dimethenamid component of Integrity adds control of annual grasses. We have previously tested Integrity at rates as high as 20 oz/A, which provided residual broadleaf weed control comparable to or better than competitive standards – atrazine premixes, Lexar/Lumax, etc. However, similar to the approach that Dow has taken with SureStart, Integrity is labeled for use only in planned preemergence followed postemergence herbicide programs. Integrity is labeled at use rates of 10 to 16 oz/A for this type of program, and it should provide the initial control needed to make this type of program work. The rates of Sharpen that are labeled for corn, 2 to 3 oz/A, and provide similar rates of saflufenacil in comparison to the use rates of Integrity.

Sharpen is labeled at the rate of only 1 oz/A in soybeans, because soybeans have less tolerance to saflufenacil compared with corn. Use rates of Optill contain a similar amount of saflufenacil. The lower rates for soybeans result in reduced residual broadleaf weed control, to the point that Sharpen should not be expected to provide substantial residual broadleaf weed control unless mixed with another residual herbicide. The Sharpen label prohibits combinations with other PPO-inhibiting herbicides, due to the possible risk of injury from combining two PPO inhibitors. This prohibition includes any PRE product containing flumioxazin (Valor, Valor XLT, Envive, Enlite, Gangster), sulfentrazone (Spartan, Authority First, Sonic, Authority MTZ, and Authority Assist), or fomesafen (Prefix). As a result, the most effective herbicides to combine with Sharpen to improve residual control may be Canopy/Cloak DF or EX, metribuzin, or Scepter.

Sharpen has activity on emerged weeds in addition to preemergence activity, and is apparently being promoted as a replacement for 2,4-D ester in preplant burndown treatments. Our research shows that while Sharpen applied alone has some foliar activity, it will not adequately control emerged weeds in no-till fields unless mixed with another herbicide that has effective foliar activity (glyphosate, Ignite), and is likely to contribute more activity on annual weeds than on biennials or perennials. This is fairly typical for herbicides that are not translocated (saflufenacil is a PPO inhibitor with contact activity), such as atrazine, metribuzin, and paraquat. All of these contribute significantly to control of emerged weeds, but effective control of the spectrum of winter weeds commonly found in Ohio no-till fields usually requires the addition of translocated herbicides also (glyphosate, 2,4-D, chlorimuron). It is also possible that two or more herbicides with contact activity can provide adequate

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burndown – atrazine + Gramoxone, Ignite + metribuzin, or Sharpen + Ignite, for example. In our research, Sharpen and Ignite have actually worked better in mixtures than Sharpen and glyphosate. We have observed inadequate control of purple deadnettle with the latter.

Sharpen does have considerable activity on marestalk, and while we need additional data in this area, mixtures of Sharpen with glyphosate or Ignite have effectively controlled marestalk. This provides an option for burndown of marestalk (and other weeds) in fields where a grower is unable or unwilling to wait 7 days between application and planting. BASF is apparently positioning the combination of Sharpen, glyphosate, and Scepter as a replacement for combinations of glyphosate, 2,4-D ester, and other broadleaf PRE herbicides such as Valor XLT, Sonic, etc. in fields with marestalk. The prevalence of ALS-resistant marestalk populations will result in inadequate residual control of marestalk in some fields where Scepter is used, unless an effective rate of metribuzin is added (0.38 to 0.5 lbs ai/A), and since Scepter is not the most effective residual herbicide on marestalk anyway. An alternative and possibly more effective approach would be a combination of glyphosate, Sharpen, Canopy DF, and metribuzin. Keep in mind that early in the spring when it is still possible to use 2,4-D ester, combinations of glyphosate, 2,4-D, and a broad-spectrum PRE herbicide, which contains an effective rate of Valor, sulfentrazone, or metribuzin, are likely to be as or more effective than Sharpen treatments. Any PRE herbicide can be mixed with the glyphosate/2,4-D mixtures, whereas certain products cannot be mixed with Sharpen. Sharpen treatments are also not likely to be as effective on dandelion as mixtures of glyphosate, 2,4-D, and a chlorimuron-containing herbicide.

Thiencarbazone-methyl Based Products Thiencarbazone-methyl is an ALS-inhibiting herbicide developed by Bayer that has residual and foliar activity on annual grasses primarily, and it has been effective for preemergence and postemergence control of grasses in OSU research. Corvus is a premix of isoxaflutole and thiencarbazone-methyl, along with cyprosulfamide, the same safener that is in Balance Flexx. Corvus rates range from 3.33 to 5.6 oz/A, and it can be applied preplant, preemergence, or postemergence up to the V2 stage of field corn and certain corn inbreds. Preplant applications of Corvus in burndown can control weeds up to 6 inches tall, although other herbicides with foliar activity should generally be added to control the spectrum of winter weeds commonly found in Ohio no-till fields. Corvus provides broad-spectrum residual control of grass and broadleaf weeds when applied preemergence, but the addition of atrazine will improve control of large-seeded broadleaf weeds (giant ragweed, cocklebur, morningglory). The addition of atrazine will also improve control of emerged weeds in burndown or postemergence applications. Adjuvants or herbicides other than atrazine should not be included in postemergence Corvus treatments.

Capreno is a premix of tembotrione (Laudis) and thiencarbazone-methyl, a new ALS-inhibiting herbicide that has foliar and residual activity on annual grass weeds. This product can be used on field corn and certain corn inbreds. Capreno can be applied postemergence from the V1 through the V7 stage of corn growth, although it should be applied with drop nozzles after the V6 stage. Capreno is most effective when broadleaf weeds are less than 6 inches tall, and grasses are less than 3 inches tall and not tillering. The addition of atrazine can improve the speed of control, and effectiveness on certain weeds. The label specifies application with crop oil concentrate and either UAN or AMS.

### **Other Corn Herbicides**

Balance Flexx (Bayer) is a new formulation of isoxaflutole that contains the safener, cyprosulfamide, which reduces the risk of corn injury. This product can be used in field corn and certain corn inbreds, and replaces Balance Pro. Balance Flexx can be applied preplant, preemergence, or postemergence up to the V2 stage of corn. Postemergence application of Balance Flexx alone will generally not control weeds larger than the 1-leaf stage, but it can be mixed with atrazine to improve control.

Prequel. (DuPont) is a premix of rimsulfuron (Resolve) and isoxaflutole (Balance Pro) for preplant and preemergence use on field corn hybrids. This product is intended for use in a planned preemergence followed by postemergence program. Prequel provides residual control of grass and broadleaf weeds, which can be improved with the addition of atrazine. Prequel can control small, emerged weeds in no-till, but the addition of atrazine or a burndown herbicide is required for weeds more than 3 inches tall.

SteadFast Q and Accent Q (DuPont) are new formulations of these products that contain isoxadifen, a safener to

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reduce the risk of corn injury. Labels are overall similar to those for Accent and Steadfast.

### **Soybean Herbicides**

Flexstar GT (Syngenta) is a premix of glyphosate and fomesafen (Flexstar) for postemergence use in Roundup Ready soybeans. The product is formulated with adjuvants, but it should generally be applied with ammonium sulfate. The label recommends the addition of crop oil concentrate, methylated seed oil, or nonionic surfactant for “difficult to control” weeds, or under adverse conditions. OSU research results have shown that the addition of crop oil concentrate or methylated seed oil is necessary when using this product to control glyphosate-resistant ragweeds. The adjuvants in most glyphosate formulations are not adequate to maximize fomesafen effectiveness on these weeds. This product will not control glyphosate-resistant marestalk, regardless of rate or adjuvant used.

Cheminova is marketing “generic equivalents” of several soybean herbicides, including Rhythm (Flexstar), Dawn (Reflex), and Tackle (Extreme). Rhythm and Dawn formulations and labels are essentially identical to Flexstar and Reflex. Tackle contains a different ratio of imazethapyr (Pursuit) to glyphosate, compared with Extreme. The Tackle use rate provides 2 oz Pursuit 2L + 0.75 lb glyphosate acid, and the Extreme use rate provides 4 oz Pursuit 2L + 0.56 lb glyphosate acid. Note: the combination of imazethapyr and glyphosate has been one of the more injurious postemergence mixtures applied to Roundup Ready soybeans.

Nufarm is marketing Cloak EX and DF, which are generic equivalents of Canopy EX and DF. Product labels and rates are similar between Canopy and Cloak products.

### **Wheat herbicides**

Axial TBC (Syngenta) is a premix of pinoxaden (Axial) and florasulam for control of ryegrass, foxtails, and barnyardgrass in wheat and barley. Axial TBC also controls some broadleaf weeds, but should generally be mixed with a broadleaf herbicide if these are present. Apply with Adigor Adjuvant when wheat is in the 3-leaf to boot stage. Axial TBC can be applied in a spray solution containing up to 50% nitrogen fertilizer solution (e.g. 28%). Allow 9 months between application and planting soybeans.

Olympus Flex (Bayer) is a premix of propoxycarbazone-sodium (Olympus) and mesosulfuron-methyl (Osprey) for control of winter annual grasses in wheat, including annual ryegrass, annual bluegrass, cheat, and downy brome. Apply from when the first fully expanded leaf of wheat is visible, up through jointing. Apply with nonionic surfactant plus either nitrogen fertilizer solution or ammonium sulfate, or with methylated seed oil (nitrogen fertilizer not required). The spray solution can contain up to 15% nitrogen fertilizer solution. Application in fall will generally provide the most effective winter annual grass control. This product also controls many winter annual broadleaf weeds, including chickweed, henbit, deadnettle, and most mustard species, but may need to be combined with a broadleaf herbicide for other weeds. Soybeans can be planted when both these conditions have been met: 5 months has elapsed and 18 inches of precipitation has occurred since application.

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### Calendar of Events

Topic	Date	Time	Location	Additional Information
OSU Extension Agricultural Policy & Outlook Meeting	December 8, 2009	9:30 A.M. to 2:00 P.M.	The Fraternal Order of Eagles 400 Eastlake Dr. Ashland, OH 44805	419-447-9722 EXT 10 or 11
OSU Extension Agricultural Policy & Outlook Meeting	December 8, 2009	4:00 P.M. to 8:30 P.M.	Attica County Fairgrounds Social Hall, Attica, OH 44807	419-447-9722 EXT 10 or 11
Central Ohio Agronomy Day	December 18, 2009	8:45 A.M. to 3:00 P.M.	OSU/COTC Newark Campus, Newark, OH Founders Hall	740-670-5315
Annie's Project - A program for "Women in Agriculture"	January 6, 2010 through February 10, 2010	Wednesday's 5:30 PM - 9 PM w/light dinner	Bellevue Recreation & Community Center 110 Cherry Blvd.	Contact Julia Woodruff @ 419-668-8219
Pesticide New Applicator Training	January 21, 2010	3:00 P.M. to 5:00 P.M.	Crawford County Courthouse, Bucyrus	419-562-8731
Richland Agronomy Day with PAT credit	January 26, 2010	1:00 P.M. to 5:00 P.M.	Longview Center 1495 W. Longview Avenue Mansfield, OH 44906	419-562-8731
Ashland Agronomy Day with PAT credit	January 28, 2010	1:00 P.M. to 5:00 P.M.	Ashland County Fairgrounds	419-562-8731
Crawford Agronomy Day with PAT credit	February 2, 2010	8:00 A.M. to 12 Noon	Crawford County Courthouse, Bucyrus	419-562-8731
Lorain County PAT	February 11, 2010	9:00 A.M. to 12 Noon	OSU Extension Office Elyria	440-326-5851
Northern Ohio Crops Day	February 18, 2010	8:30 A.M. to 4:00 P.M.	Ole Zim's - Fremont	419-334-6340
Erie County PAT	February 24, 2010	6:00 P.M. - 9:00 P.M.	EHOVE, Milan	419-627-7631
Sandusky County PAT	March 9, 2010	9:00 A.M. to 12 Noon	Woodville - Luckey Farms	419-334-6340
Huron County PAT	March 17, 2010	9:00 A.M. to 12 Noon	OSU Extension Office Norwalk	419-668-8219
Huron County Pesticide New Applicator Training	March 25, 2010	9:00 A.M. to 11:00 A.M.	OSU Extension Office Norwalk	419-668-8219
Huron County Pesticide ODA Exam	March 25, 2010	1:00 P.M.	OSU Extension Office Norwalk	419-668-8219
Pesticide New Applicator Training	January 21, 2010	3:00 P.M. to 5:00 P.M.	Crawford County Courthouse, Bucyrus	419-562-8731
Ottawa County PAT	March 24, 2010	6:00 P.M. to 9:00 P.M.	OSU Extension Office, Oak Harbor	419-898-3631
Crawford County PAT Test	March 25, 2010	1:00 P.M. to 5:00 P.M.	Crawford County Courthouse, Bucyrus	1-800-282-1955
Crawford County PAT Session	March 25, 2010	6:00 P.M. - 10:00 P.M.	Crawford County Courthouse, Bucyrus	419-562-8731
Wood County PAT Test	March 25, 2010	9:00 A.M.	Junior Fair Building Bowling Green	419-354-9050
Wood County PAT	March 25, 2010	1:00 P.M. to 4:00 P.M.	Junior Fair Building Bowling Green	419-354-9050