k-state extension AGRONOMY e-Updates

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1. Controlling problem weeds in Roundup Ready corn with glyphosate tank mixes

A postemergence application of glyphosate in Roundup Ready corn usually does a good job of controlling most broadleaf and grassy weeds. But there are times when control of certain broadleaf weeds with glyphosate is not adequate.

The following are some of the most common broadleaf weed problems in Roundup Ready corn, both in eastern and western Kansas, as well as the most effective herbicides that can be tank mixed with glyphosate to help control each of these problem weeds.

* Waterhemp and Palmer amaranth. Waterhemp and Palmer amaranth are vigorous weeds, with multiple buds on a plant. This requires thorough spray coverage. They are small-seeded pigweeds that emerge throughout the summer, unless there is a thick crop canopy to shade the ground. Some populations of waterhemp have become resistant to glyphosate. Callisto, Impact, and Laudis are isoxazole herbicides that can be tank mixed with glyphosate to help control waterhemp and Palmer amaranth. These herbicides have some residual activity. Lumax, which contains Callisto, is another option. Lumax also helps with grass control because it contains S-metolachlor and atrazine. All of these herbicides will provide some residual control for late-emerging waterhemp and Palmer amaranth. Status, which is Distinct mixed with a crop safener, can also be tankmixed with glyphosate to help with pigweed control. Status provides a little residual control. Instead of applying glyphosate alone or with a tankmix herbicide, producers could also use Halex GT, a premix of a high rate of glyphosate along with some Callisto and S-metolachlor.

* Velvetleaf. Velvetleaf is sometimes not controlled adequately by glyphosate alone. Some of this may have to with the time of day glyphosate is applied, poor choice of AMS replacement product in the glyphosate, the condition of the plants, or other factors. As with waterhemp and Palmer amaranth, adding Callisto, Impact, Laudis, or Lumax to the glyphosate can help with

velvetleaf control. Another option is to tank mix glyphosate with Cadet, Aim EW, or Priority (a premix of Aim EW and Permit, an ALS herbicide). One of the concerns about a tankmix of Aim and glyphosate, however, is that the Aim might reduce the ability of glyphosate to translocate to the growing points in the plant.

* Morningglory. This is another broadleaf weed that is not always controlled well with glyphosate. Adding Status (Distinct plus a crop safener) to glyphosate is one of the best ways to improve morningglory control in Roundup Ready corn. Aim EW and Priority can also help with morningglory control. Callisto, Impact, and Laudis may not be the choice if morningglory is a severe problem, although if a pound of atrazine is added, these herbicides can be very effective. Actually 2,4-D is very good on morningglory as well.

* Kochia. Kochia is like Palmer amaranth in some ways. It is a small-seeded broadleaf weed that can emerge all through the summer. This weed can escape control with glyphosate alone unless it is actively growing and is thoroughly covered by the spray. To improve control and gain a little residual control, producers can tank mix glyphosate with Status, which is Distinct with a crop safener added. As noted above, Status will also give excellent control of pigweeds, and good control of velvetleaf. Another option would be to tank mix glyphosate with Callisto, Impact, Laudis, or Lumax.

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2. Early-season fungicide applications on wheat

The practice of applying a low rate of fungicide to wheat at spring greenup has gained some interest recently. In most cases, it will be possible to follow up later (flag leaf to flowering stage) with a full rate of fungicide if it becomes necessary.

The advantages of early-season, low-rate fungicide application include:

* Low cost. No additional cost for application if the fungicide is tank mixed with other products, such as liquid nitrogen fertilizer or herbicide.

* Provides suppression of for early-season diseases such as tan spot, powdery mildew, and speckled leaf blotch.

The limitations of early-season, low-rate fungicide application:

* Leaves not present at time of application will not be protected. Therefore, these applications will not control leaf rust or stripe rust epidemics that come from the south at later growth stages.

* Additional product cost may not pay off under some conditions.
In 2007-08, we tested the effectiveness of an early-season, low-rate fungicide application compared to an application at flag leaf. We also tested the combination of both application

timings. Jagalene is moderately susceptible to tan spot and very susceptible to powdery mildew. Fuller is intermediate to tan spot and moderately susceptible to powdery mildew.

The Sumner county location (Table 1) was wheat on wheat in a minimum tillage system, and had the highest disease pressure and greatest diversity of disease present (tan spot, powdery mildew, leaf rust, and stripe rust). Fungicide treatment at this location was profitable in most situations, but yield of early treatment alone to Fuller was lower than other treatments. The Reno County location (Table 2) also had considerable disease pressure but disease tended to arrive later. Leaf rust and Septoria were dominate diseases at this location. Only the applications to the susceptible variety Jagalene resulted in profit. Wheat at the Republic County location (Table 3) was planted late after soybeans and had lower yield potential. The disease pressure was low at this location relative to the other locations. Leaf rust did arrive at the location, but not until late in kernel development. None of the fungicide treatments resulted in profit on either variety at this location.

In general, these results indicate that early-season, low-rate applications of fungicides are most likely to be effective in continuous wheat grown in high-residue conditions, and with varieties that are susceptible to either tan spot or powdery mildew. The value of the early applications is diminished in other rotations, conventional tillage systems, or with a variety that is moderately resistant to tan spot and powdery mildew.

Early Fungicide Application Studies 2007-2008

Table 1. Sumner County: Continuous wheat, reduced tillage

	Jagalene						Fuller					
				Potential profit ($) at various wheat prices*						Potential profit ($) at various wheat prices		
Application timing	% Disease severity**	Yield (bu/A)	Yield diff. (bu/A)	$4/ bu	$6/ bu	$8/ bu	% Disease severity**	Yield (bu/A)	Yield diff. (bu/A)	$4/ bu	$6/ bu	$8/ bu
Untreated	31.8 A	23.5 B	--				9.3	41.9	--			
Early (GS 5)	18.3 B	32.6 AB	9.1	+	+	+	5.1	39.8	-2.1	-	-	-
Flag (GS 10.53)	4.5 C	35.4 AB	11.9	+	+	+	2.0	48.0	6.1	+	+	+
Early + Flag	3.8 C	40.1 A	16.6	+	+	+	1.9	48.9	7.0	+	+	+
LSD	13.4	16.1					6.7	NS				

Table 2. Reno County: Very little wheat residue at planting

	Jagalene						Fuller					
				Potential profit ($) at various wheat prices*						Potential profit ($) at various wheat prices		
Application timing	% Disease severity**	Yield (bu/A)	Yield diff. (bu/A)	$4/ bu	$6/ bu	$8/ bu	% Disease severity**	Yield (bu/A)	Yield diff. (bu/A)	$4/ bu	$6/ bu	$8/ bu
Untreated	47.3 A	20.4 B	--				2.6	44.1				
Early (GS 5)	39.0 A	23.9 B	3.5	+	+	+	2.7	39.4	-4.7	-	-	-
Flag (GS 10)	16.5 B	25.5 AB	5.1	-	+	+	1.7	45.3	1.2	-	-	-
Early + Flag	15.8 B	30.2 A	9.8	+	+	+	1.3	48.1	4.0	-	-	-
LSD	15.6	6.3					1.7	NS				

Table 3. Republic County: Wheat after soybeans, no-till

	Jagalene						Fuller					
				Potential profit ($) at various wheat prices*						Potential profit ($) at various wheat prices		
Application timing	% Disease severity**	Yield (bu/A)	Yield diff. (bu/A)	$4/ bu	$6/ bu	$8/ bu	% Disease severity**	Yield (bu/A)	Yield diff. (bu/A)	$4/ bu	$6/ bu	$8/ bu
Untreated	21.3 A	19.1	--				3.6	32.2	--			
Early (GS 5)	20.9 A	17.9	-1.2	-	-	-	3.3	32.2	0.0	-	-	-
Flag (GS 10.3)	5.8 B	23.6	4.5	-	-	+	2.4	34.2	2.0	-	-	-
Early + Flag	3.6 B	23.2	4.1	-	-	-	2.0	32.4	0.2	-	-	-
LSD	12.8	NS					NS	NS				

Treatments: Early = 3 fl. oz. Headline (Feekes 5); Flag = 14 fl. oz Quilt (Feekes 10 to 10.53); Early + Flag (Feekes 5 + Feekes 10 to 10.53)

Potential profit: + = Yield difference between treated plots and untreated plots is 1 bu greater than the minimum number of bushels required to break even when grain price is at $4, $6, or $8. Assumes cost of early application cost is $6.75 (product only), Flag application (product + application) is $21.27, and early + flag is $28.02.

* "+" = Positive yield response; "-" = No yield response

** Composite of all diseases on flag leaf at approximately milk to soft dough stage

We also have summarized the results of research targeting the early application of fungicides in recent years (Table 4). The studies focused on the comparison of early (stem elongation) applications with applications made to the flag leaves at heading. This summary suggests that the yield response from the early applications is highly variable, and is some situations can be negative. This variability results in a lower average profit and reduced likelihood of profit for the early applications compared to the applications made at the heading stages of growth. Interestingly, the likelihood of profit is only slightly lower at these locations and years. We suspect that the low cost of the early applications helps keep the comparison is close even thought the yield response is consistently lower and more variable.

Table 4. Summary of results of early and flag leaf fungicide applications 2005-2008

				Average profit ($) at various wheat prices			Likelihood of profit (%)[2]		
Application timing	Number of obs.	Average yield response (bu/A)	Standard deviation (bu/A)	$4/bu	$6/bu	$8/bu	$4/bu	$6/bu	$8/bu
Early (GS 4 or 5)	31	1.5	4.22 (-2.75 to 5.69)[1]	- 0.86	2.08	5.03	54.8	58.1	58.1
Flag (GS 10 to 10.53)	31	5.5	5.14 (0.4 to 10.68)	0.40	11.47	22.54	45.2	61.3	67.7

[1]Values in parentheses indicate the yield response one standard deviation above and below the mean

[2]Likelihood that the treatment resulted in a yield response equal to or greater than the costs associated with the treatment, given $4, $6, or $8 per bushel grain price. Assumes cost of early application cost is $6.75 (product only), Flag application (product + application) is $21.27, and early + flag is $28.02 per acre.

In 2008, we added a treatment that combined the early and flag leaf applications to our experiments. These results suggest that applications made at heading alone or the combination treatment resulted in higher yield and greater likelihood of profit than did the early application alone. This trend was most noticeable when the price of wheat is greater than $6.

Table 5. Summary of results of early, flag leaf, and combination fungicide applications in 2008

				Average profit ($) at various wheat prices			Likelihood of profit (%)[2]		
Application timing	Number of obs.	Average yield response (bu/A)	Standard deviation (bu/A)	$4/bu	$6/bu	$8/bu	$4/bu	$6/bu	$8/bu
Early (GS 4 or 5)	19	2.2	3.8 (-1.7 to 6.0)[1]	1.96	6.31	10.67	63.2	63.2	63.2
Flag (GS 10 to 10.53)	19	6.6	4.8 (1.8 to 11.5)	4.87	18.17	31.48	47.4	73.7	78.9
Early + Flag	19	9.6	5.7 (4.0 to 15.2)	22.60	33.90	45.20	57.9	78.9	94.7

[1]Values in parentheses indicate the yield response one standard deviation above and below the mean
[2]Likelihood that the treatment resulted in a yield response equal to or greater than the costs associated with the treatment, given $4, $6, or $8 per bushel grain price. Assumes cost of early application cost is $6.75 (product only), Flag application (product + application) is $21.27, and early + flag is $28.02 per acre.

The main conclusions we can draw from these studies so far:

* Early-season, low-rate fungicide applications had about a 55 to 63 percent likelihood of returning a profit when wheat is at $4 per bushel and the cost of fungicide is $6.75 per acre.

* The likelihood of profit for an early-season, low-rate fungicide application was greatest under continuous wheat, and with a variety such as Jagalene that is more susceptible to tan spot and powdery mildew.

* In 2008, the greatest average profit came from the combination of an early-season followed by a flag leaf application of fungicides. These results should be confirmed with additional research before they become a standard recommendation.

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3. Alternative herbicide programs in Roundup Ready soybeans

There are several good reasons for applying a preplant or preemergence “foundation” herbicide on Roundup Ready soybeans. Producers may want to:

- Get early season control of weeds and grasses so that only one postemergence application of glyphosate is needed instead of two.

- Provide some residual weed control before and following the postemergence glyphosate.

- Provide some assistance to glyphosate in controlling certain broadleaf weeds.

- Use a second herbicide mode of action to prevent or delay the development of glyphosate-resistant weeds.

In developing an alternative to the exclusive use of postemergence glyphosate treatments on Roundup Ready soybeans, it is useful to know what weeds or grasses are being targeted. Some of the most common weed and grass problems include:

* Pigweeds (including waterhemp and Palmer amaranth). For early-season pigweed control, the Valor-based herbicides (Valor SX, Valor XLT, Gangster, Envive, and Enlite) and Authority-based herbicides (Authority First, Sonic, Authority Assist, Authority MTZ, and Spartan) can all provide very good to excellent control to supplement a postemergence glyphosate program. Prefix is another excellent "foundation" herbicide for residual pigweed control in soybeans.

* Velvetleaf. Glyphosate is not always entirely effective on velvetleaf. To assist in velvetleaf control, Valor and FirstRate-based herbicides (Valor SX, Valor XLT, Gangster, Authority First, and Sonic) are some of the most effective preplant and preemergence herbicides producers can use.

* Cocklebur. The most effective preplant and preemergence herbicides to aid in cocklebur control are those that contain First Rate, Classic, or Scepter, which would include Authority First, Sonic, Gangster, Envive, and Valor XLT. Extreme, which is a premix of glyphosate and Pursuit, can also be used as a preplant or postemergence treatment in Roundup Ready soybeans and provide residual cocklebur control.

* Marestail. There are populations of marestail in Kansas that are resistant to glyphosate. Marestail control in Roundup Ready soybeans should begin with a preplant burndown program that includes 2,4-D, at least 1 weak ahead of planting and before marestail have started to bolt. Other residual preplant herbicides that can help with burndown and residual marestail control include FirstRate-based herbicides, such as Authority First, Sonic, or Gangster. Marestail is best controlled before soybean planting and the marestail begin to bolt. FirstRate would probably be the most effective alternative to glyphosate for postemergence marestail control in RR soybeans.

* Morningglory. Glyphosate sometimes has trouble controlling morningglory. To help get better control, producers can use either Authority or Valor-based herbicides preplant or preemergence.

* Crabgrass and other small seed grasses. Glyphosate usually gives good control of most grasses, but producers may want to apply a foundation herbicide to control grasses early, then make just one postemergence glyphosate application later. Prefix, Intrro, Dual II Magnum, Outlook, and Prowl H2O can all provide good grass and pigweed control ahead of RR soybeans. Of these, Prefix generally provides the best pigweed control, and Prowl H20 the least.

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4. Additional comment on conventional soybean varieties

After reading the article in last week's issue (No. 172, January 9, 2009) about conventional soybean varieties, one of our readers mentioned that conventional soybeans from most private

companies would likely be protected by a plant patent instead of PVP law. Seed from a patented conventional variety could not be saved and replanted by the producer. This would not apply to most conventional soybean varieties from public breeding programs under Plant Variety Protection (PVP) and licensing agreements. Producers would not have to pay the Roundup Ready technology fee on a conventional soybean variety from either a private company or a public breeding program, whether the variety is covered by a plant patent or PVP.

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These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Steve Watson, 785-532-7105 swatson@ksu.edu, or Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader 785-532-0397 jshroyer@ksu.edu