Plant Protection Programs University of Missouri

Integrated Pest & Crop Management

Considering Fall Herbicide Options in Corn and Soybean

By Kevin Bradley

As we progress through the harvest season, many are beginning to consider fall herbicide applications for the winter annual weeds that are now emerging in corn and soybean fields around the state. In Missouri, some of our most common winter annual weed problems are henbit, purple deadnettle, chickweed, shepherd's-purse, field pennycress, fleabane, and horseweed (also known as marestail). Dandelion, a perennial that can be present in the fall and early spring, is also becoming more common in some areas.

Some producers like fall herbicide applications because it enables them to reduce spring workloads and control winter annual weeds in the fall rather than using a burndown herbicide prior to planting in the spring. Due to the extremely wet spring and flooding we experienced in some areas this year, those producers who made fall herbicide applications last year seemed to benefit because they did not have dense mats of weeds present at the time of corn or soybean planting. Because of this, I have heard from many producers that have a "renewed interest" in making a fall herbicide application this year.

My opinion of the utility of fall herbicide applications has always centered around one issue; the ability of the program to replace the need for a spring burndown application prior to corn or soybean planting. If you choose to go with a fall herbicide application it ***must*** replace the need for the spring burndown. Otherwise, it seems to me that a fall herbicide application is just an added cost in the overall weed management program.

If you choose to make a fall herbicide application, you should choose a program with enough residual activity to control winter annual weeds that may come up later this fall as well as any that may emerge next spring. From what I have seen, weeds like henbit and purple deadnettle germinate predominantly in the fall while weeds like horseweed, field pennycress, and common chickweed are more variable and may germinate throughout the fall or spring. In our research, the control of some winter annual weeds with a non-residual treatment like glyphosate plus 2, 4-D in the fall has been extremely variable compared to residual herbicide programs. This is why I generally do not recommend these kind of non-residual fall herbicide programs.

For the most part, the herbicide options available in the corn market have not changed dramatically over the past several seasons. Some of the most common fall herbicide programs used in fields planted to corn include Princep, Basis, Valor, and Autumn. Authority MTZ (Authority + Sencor) is a new option that is now available for fall application to fields that will be planted to either corn or soybean in the spring.

For fields that will be planted to soybean, Canopy EX and Valor have been available for several years and both have residual activity on a variety of winter annual weeds. In 2007, Autumn was also labeled for fall application prior to soybean planting. This year, several new products are available for use in the fall market. Envive and Enlite, which are prepackaged mixes of Classic, Valor, and Harmony at different ratios, can now be applied in the fall prior to soybean planting. Similarly, Valor XLT, a prepackaged mix of Valor and Classic, is another new addition to this market. FMC also has Authority First (Authority plus Firstrate) and

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Diplodia Ear Rot of Corn

By Laura Sweets

Diplodia ear rot has been unusually widespread and severe in Missouri this season. There have been many questions related to this disease including questions on whether to harvest at high moisture contents to prevent further development of Diplodia and the possibility of mycotoxins associated with Diplodia. Although it is difficult to give definitive answers to some of these questions, a more detailed look at the disease may help in making decisions on how to handle fields with high levels of Diplodia ear rot.

Diplodia ear rot is caused by the fungus *Stenocarpella maydis* formerly known as *Diplodia maydis*. When infection occurs just after silking, the ear leaf and husks on the ear may

Bleaching of ear leaf and husks due to Diplodia ear rot.

appear prematurely bleached or straw-colored. The bleached ear leaf and husks stand out in a very striking pattern against the green foliage of the rest of the plant. When the husk is peeled back, dense white to grayish-white mold growth will

Diplodia ear rot on corn.

be matted between the kernels and between the ear and the husks. In fact, husks may be difficult to peel back on ears with severe infections of Diplodia ear rot. Small, black fungal fruiting bodies may be scattered on husks or embedded in cob tissues and kernels. The entire ear may be grayish-brown, shrunken, very lightweight and completely rotted.

Stenocarpella maydis (Diplodia maydis) can also cause a stalk rot of corn. With the stalk rot, affected plants may wilt, the foliage may appear off-color or gray- green in color, the lower leaves may become bleached in color and the internal pith tissues of the stalk deteriorate and disintegrate. Small,

Diplodia fruiting bodies embedded in kernel and cob tissue.

black fungal fruiting bodies similar to those formed on ears and cobs may also be found in stalk tissues. The fungus overwinters in stalk and cob debris remaining in the field. During wet weather the following season, the fungal fruiting bodies produce spores which may be spread to silks on current season corn plants by splashing rain. The fungus then grows down the silks into the ears. The fungus may also enter the husk by growing between the ear shoot and the sheath of the ear leaf. In this case infection may be heaviest at the base of the ear. Insect damage and bird damage may also predispose corn plants to infection. Ears tend to be most susceptible to infection for three weeks after silking when silks are senescing. Diplodia ear rot is favored by wet weather just after silking and is more severe when corn is planted following corn.

With Diplodia ear rot, some kernels may be very lightweight, shrunken and fairly dried out. However, because of the amount of fungal growth on the ears, the ears and cobs can also be completely rotted and appear wetter than normal. The lightweight, shriveled and shrunken kernels may be blown out of the combine during harvest. Adjusting the combine to blow as much of this material as possible would be recommended. Monitoring loads to see if clumps of wet kernels or matted kernels, husk and cob material is present is also important. If much of this material is in corn going into storage, knowing the moisture content and trying to lower the moisture content to 15% moisture as quickly as possible

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will be important. Diplodia will not necessarily continue to develop on corn in storage, but high levels of the small, lightweight kernels can hinder air movement in stored grain leading to increased risk for stored grain insects and other storage molds. Clumps of wet kernels and foreign debris may also hinder air movement and by their higher moisture content increase the risk for stored grain insects and other storage molds.

Stenocarpella maydis (Diplodia maydis) is not considered to by a mycotoxin producing fungus in the United States. Although *Stenocarpella maydis (Diplodia maydis)* occurs world-wide, wherever corn is grown, diplodiosis (a disorder of cattle and sheep consuming corn infected with Diplodia ear rot) has occurred only in South Africa.

Little can be done to prevent or reduce the invasion of corn by fungi in the field. However, if Diplodia ear rot developed in the field, it is important to harvest the field in a timely manner and to store the grain under the best possible conditions. Adjust harvest equipment for minimum kernel damage and maximum cleaning. Before storing grain, clean bins thoroughly to remove dirt, dust and any grain left in or around bins. Thoroughly clean grain going into storage to remove chaff, other foreign material and cracked or broken kernels. Dry grain to 15% moisture as quickly as possible and monitor grain on a regular basis throughout storage life to insure moisture and temperature are maintained at correct levels. Protect grain from insects.

Fields which had high levels of Diplodia ear rot this season should not be planted to corn next year. Crop rotation is the main management strategy for this disease. Hybrids do vary in their susceptibility to Diplodia ear rot and stalk rot so noting any hybrids which had high levels this season and checking with seed company representatives for information on hybrid reaction to Diplodia may be useful.

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Discolored Soybean Seed

By Laura Sweets

This may be a year when soybean seed discoloration is a widespread problem in Missouri. Soybean diseases are one of several factors which can cause discoloration and deterioration of soybean seed. But soybean diseases are only one of the factors which may be involved in this year's problem. Much of the state has been unusually wet for most of the season. The late season soybean diseases which can lead to discolored soybean seed tend to be favored by wet conditions including frequent rains, heavy dews and high humidity. Discoloration of soybean seed this year appears to be the result of environmental stress compounded by late season stem and pod diseases.

When the late season pod and stem diseases occur, maturing plants have a blackish cast and black to gray spots, blotches and streaks may cover stems, branches and pods. The late season diseases lead to increased problems with discolored and damaged soybean seed. Purple seed stain; a general blotchy brown discoloration that might be the result of the Cercospora or Colletotrichum species which cause anthracnose and tipblight; bleeding hilum which can be caused by virus diseases such as soybean mosaic and bean pod mottle; a white mold growth which could be Phomopsis seed decay or secondary fungi entering through pods damaged by insects are all showing up in beans. The diseases which contribute to discolored soybean seed are usually favored by wet conditions late in the season. Weather conditions from now through harvest will have a major influence on how severe discoloration and deterioration of soybean seed is this season.

Symptoms of the seed damage which may result from Phomopsis seed decay, purple seed stain, frogeye leaf spot, virus diseases and Colletotrichum anthracnose and tipblight are described below.

Phomopsis seed decay: Phomopsis seed decay results when the fungi which cause pod and stem blight move from the stems and pods onto the seed. Plants infected with pod and stem blight may be stunted and have discolored stems.

Phomopsis seed decay.

Black pycnidia or fruiting bodies of the fungi *Phomopsis sojae* or *Phomopsis longicolla* develop on the lower portion of the main stem, branches and pods as plants reach maturity.

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The pycnidia may be limited to small patches usually near the nodes or may cover dead stems and pods. On stems, the pycnidia are usually arranged in linear rows while on pods they are randomly scattered. Prolonged periods of warm, wet weather during flowering and pod fill favor the development of pod and stem blight. If conditions remain warm and wet, the fungus may grow through the pods and infect the seed. Infected seed is oblong or misshapen and may have a white moldy appearance.

Purple seed stain: *Cercospora kikuchii* can infect soybean seeds, pods, stems and leaves but is most commonly found on the seed. However, during the last several years leaf spot and leaf blight caused by this fungus have been prevalent in parts of the state. Leaf blight occurs on the uppermost leaves and begins as reddish purple to reddish brown angular to somewhat circular lesions on the soybean leaves. These

Purple seed stain.

lesions may coalesce to kill larger areas of leaf tissue. The entire uppermost trifoliolate leaf and petiole may be blighted and brown. Cercospora leaf spot may develop as a premature yellowing and then blighting of the youngest, upper leaves over large areas of affected fields. Brown lesions or spots are usually evident in the yellowed tissue. In most fields symptoms do not progress down the plants more than one to two nodes. Pods at the uppermost nodes may develop round, reddish purple to reddish brown lesions. Infected seed show a conspicuous discoloration varying in color from pink to pale purple to dark purple. The discoloration may range from small specks to large blotches which cover the entire surface of the seed coat. Warm, humid weather favors disease development. Yields are usually not reduced but a high percent of seed stain may be evident at harvest.

Frogeye leaf spot: *Cercospora sojina* causes frogeye leaf spot on soybean. Symptoms occur primarily on leaves although the causal fungus may also infect stems, pods and seeds. Lesions are small, circular to somewhat angular spots that develop on the upper leaf surfaces. Initially the spots are dark and water soaked in appearance. As the lesions age they develop a dark reddish-brown border. The center of the lesion becomes light brown to light gray in color. Lesions may merge to kill larger areas of the leaf. Heavily spotted leaves may wither and drop prematurely. Stem lesions usually develop later in the season. Young stem lesions are deep red with a narrow, dark brown to black margin. As the stem lesions age, the centers become brown to smoky gray in color. Lesions on pods are circular to elongate, slightly sunken and reddish brown. The fungus can grow through the pod wall to infect maturing seed. Infected seeds may show discoloration of the seed coat that ranges from small specks to large blotches of light gray to dark gray or brown.

Virus diseases: There are several virus diseases which may occur on soybean in Missouri including bean pod mottle, soybean mosaic and tobacco ringspot or budblight. Of these, soybean mosaic virus and bean pod mottle virus are most likely to cause symptoms on the seed. Seed infected with soybean mosaic or bean pod mottle virus may have a symptom called bleeding hilum. This is a discoloration, usually black or dark in color that bleeds from the hilum down the sides of the seed. The affected area may be quite small and near the hilum or may be quite extensive and cover most of the seed. It is important to keep in mind that bleeding hilum is also a genetic characteristic of certain soybean varieties. The intensity of the discoloration can be influenced by environmental conditions during the growing season.

Colletotrichum anthracnose and tipblight: *Colletotrichum truncatum* and several other *Colletotrichum* species cause anthracnose of soybean. Typically, anthracnose is a late season stem and pod disease of soybean. Symptoms occur on stems, pods and petioles as irregularly shaped, light to dark brown spots, streaks or lesions. Eventually black fungal structures may be evident in these lesions. Anthracnose may also cause a tipblight. The tipblight phase of anthracnose causes a yellowing or browning of the uppermost leaves and pods. The blighted tips may dry up and die prematurely. This fungus may also infect seed. Seed may be smaller than normal and severely infected seed may be a moldy, dark brown in color and shriveled. Anthracnose is favored by warm, wet weather, and the tipblight phase of anthracnose is most likely to occur after a rainy period.

The incidence and severity of the soybean diseases which cause seed discoloration and deterioration are greatly increased by warm, wet conditions late in the season. For grain crops there are no potential rescue treatments. Fields should be harvested as soon as possible to prevent further seed damage.

Many of the pathogens causing seed discoloration and deterioration can survive on soybean seed. Heavily infected seed, if planted, could produce diseased seedlings resulting in

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stand problems. Therefore, seed from infected fields should not be saved for planting. If infected seed must be used for planting, it should be thoroughly cleaned, a sample submitted for a germination test (preferably a stress test) and a fungicide seed treatment applied.

Many of the pathogens that cause these diseases may also survive in infested residues left on the soil surface. Thus, crop rotation is an important means of preventing or reducing disease outbreaks. At least one year between soybean crops is recommended. Varieties may differ in their reaction to these various diseases and, if possible, good quality seed of resistant varieties should be planted.

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and Authority MTZ (Authority plus Sencor) available for application in the fall prior to soybean planting.

With all of these fall herbicide programs, 2, 4-D ester should be added to enhance the control of broadleaf weeds present at the time of the application. If winter annual grasses

are present you should also consider applying glyphosate with your residual herbicide treatment, as very few of these products provide any control of winter annual grass weeds.

Although fall herbicide programs can provide good control of winter annual weeds up to corn or soybean planting, our research has shown that applications of these same residual herbicides made 30- to 45- days prior to planting in the spring can provide similar levels of winter annual weed control. Additionally, our data indicate that early spring applications of these herbicides will provide provide better control of early-emerging summer annual weeds than applications of these same herbicides in the fall.

So far, this has not been a very popular message or commonly adopted practice in Missouri. And probably for good reason. First, applying these residual herbicides in the early spring rather than the fall is adding to the spring workload, not reducing it, which is one of the main reasons producers have adopted fall herbicide applications in the first place. Second, we often experience very wet springs and it is sometimes difficult to even get across fields to make a herbicide application at this time of the year. Regardless, our results still indicate that with our current herbicide arsenal, the early spring timing is better if your objective is to achieve excellent winter annual and some summer annual weed control. If your primarily goal is just to eliminate your winter annual weed populations, then our research indicates that there are a variety of fall herbicide programs that will perform similarly.

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It is Too Early for Fall Anhydrous Ammonia Applications for Corn

By John A. Lory and Peter Scharf

The best approach to insure fertilizer nitrogen is available to a corn crop is to apply it as close as possible to peak plant nitrogen demand in late spring. However, logistics and other factors lead many farmers to consider fall application of nitrogen for corn.

Applying nitrogen too early in fall increases the risk that the nitrogen will be lost from the soil. I do not recommend fall nitrogen applications until soil temperature at six inches drops below 40º F. This typically occurs in mid-November in northern Missouri.

Average six-inch soil temperature in northern Missouri as of October 12 when this article was written were still in the mid to low 60's. You can look up current daily six-inch soil temperatures at the University of Missouri website: http://agebb.missouri.edu/weather/reports/soysoil6.asp. You can also sign up for a periodic weather e-mail that includes a graph of six-inch soil temperature through the University of Missouri service HorizonPoint (http://agebb.missouri.edu/horizonpoint/).

Manure nitrogen and anhydrous nitrogen tend to stay in the ammonium form that resists over-winter losses when injected into cold soil. If you apply either nitrogen source too early in fall to a warm soil the nitrogen will convert to nitrate, a highly mobile form of nitrogen prone to losses.

In southern Missouri, fall and winter soil temperatures rarely remain cold enough to delay nitrate conversion so fall applications are not recommended. North of I-70 fall applications can work if you take steps to insure fall-applied nitrogen is not lost.

Products can be added to nitrogen fertilizers to delay the conversion of nitrogen to nitrate. These products reduce but do not eliminate the risk of nitrogen losses from nitrogen applications. N-serve (a nitrification inhibitor) can be added to anhydrous ammonia. High fertilizer prices make the economics of inhibitors more favorable.

There is no strategy to guarantee that fall-applied nitrogen will successfully make it through fall, winter and spring and be available for your corn crop in June and July. Injecting nitrogen to nearly frozen soils and using inhibitors will make it more likely that fall-applied nitrogen will be there in the spring. The later you wait in the fall and the colder the soil is at the time of application the more likely the nitrogen will make it through the winter.

Be patient! It is still too early for fall anhydrous ammonia applications for next year's corn crop!

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Prepare Now for Optimum Soybean Production in 2009

By Allen Wrather, University of Missouri-Delta Center

Soybean farmers can do a few simple things to optimize yield in 2009 to ensure profits. The following is a list of 9 tasks that will help soybean farmers improve yield.

1. Select the fields you intend to plant to soybean in 2009 and test a sample of the soil from each 10-acre block of each field for pH and nutrients if this has not been done since 2005.
2. Apply needed lime, phosphate, and potash ASAP.
3. Break hardpans by subsoiling if the soil dries enough before planting time next spring.
4. Improve drainage of the fields to reduce problems due to seedling diseases.
5. If soybean cyst nematode problems are suspected, farmers should sample the soil during early winter and have the samples analyzed for nematodes. These results will be useful when selecting varieties for 2009.
6. Select varieties based on University of Missouri soybean yield trials, see http://agebb.missouri.edu/cropperf/soybean/index.htm, and the yield of varieties in your own and your neighbor's fields.
7. Hire a commercial seed treater to apply a fungicide to seed that you will plant in April or that you will plant in heave clay soils prior to mid-May.
8. Plant at the best time for optimum soybean yields; soybean yields generally begin to decline when planted after early-June.
9. Hire a consultant.

Following these suggested procedures will give soybean farmers a better chance of producing a profitable crop during 2009.

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Managing High Phosphorus Prices

By John A. Lory and Peter Scharf

The remarkable, unprecedented rise in fertilizer phosphorus prices has farmers searching for ways to reduce phosphorus applications. How you proceed will depends on how you anticipate phosphorus prices will change over the next few years.

High prices currently are driven by higher worldwide demand for phosphorus than supply. Industry projections imply demand will continue to exceed supply for at least the next couple of years. This implies phosphorus prices will remain high. However the recent turmoil in the world economy may reduce global demand making the current estimate for demand over-stated.

Many farmers have used soil testing in a phosphorus soil fertility program to bring their soil test levels to an optimum level (approximately 22 ppm Bray-I P). Phosphorus application on these farms maintains optimum soil test levels by replacing phosphorus removed by the crop either annually or every other year. Taking one or even two years off from maintenance phosphorus applications on high yielding fields is unlikely to reduce yields. If you do not apply phosphorus fertilizer for too many years soil test levels will drop to a point that will reduce yield.

Postponing phosphorus applications on optimum testing fields may make sense if you expect phosphorus prices to fall significantly in the next year or two. By not applying now you avoid current high prices but will need to invest in extra phosphorus in the future to compensate for the missed applications. Using this approach you would save money if phosphorus prices fall because you would spend less for fertilizer bought at the lower price in the future.

If you predict phosphorus prices will stay the same or increase over the next few years there is no benefit to delaying phosphorus applications on fields with optimum soil test phosphorus levels. In this scenario, waiting to apply provides no opportunity of savings and may cost extra money if prices rise. Delaying applications under these conditions only makes sense if it helps you address short-term financial management goals for your farm.

Farmers who have low phosphorus testing soils that are trying to maximize yield will need to apply phosphorus fertilizer despite high prices. Low testing fields need annual applications to provide enough phosphorus in the soil to maintain high yields. Most fertilizer recommendations on low testing fields include phosphorus to raise soil test towards optimum (buildup phosphorus) plus fertilizer to replace phosphorus removed by the crop (maintenance phosphorus). Farmers with low testing fields may chose to reduce or eliminate buildup phosphorus to save money. For example, high fertilizer prices may favor an eight-year buildup strategy instead of a four-year buildup strategy. This will slow the pace of raising soil test phosphorus to optimum but is unlikely to negatively affect yields. On low testing soils maintenance phosphorus applications are needed if the objective is to maximize yield.

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Weather Data for the Week Ending October 13, 2008

By Pat Guinan

		Weekly Temperature (oF)						Monthly Precipitation (in.)		Growing Degree Days‡	
Station	County	Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	Sep 1-22-Sep	Departure from long term avg.	Accumulated Since Apr. 1	Departure from long term avg.
Corning	Atchison	75	51	82	38	63	+7	1.51	+0.25	3491	+142
St. Joseph	Buchanan	73	51	78	42	62	+6	0.68	-0.68	3317	-79
Brunswick	Carroll	79	51	83	41	65	+9	0.33	-1.05	3380	-61
Albany	Gentry	73	48	80	36	61	+6	0.86	-0.18	3239	-117
Auxvasse	Audrain	76	54	80	44	64	+8	0.62	-0.68	3326	-148
Columbia-Sanborn Field	Boone	76	56	81	46	66	+8	0.43	-1.04	3604	-107
Columbia-South Farms	Boone	75	55	80	44	64	+7	0.50	-0.94	3419	-196
Williamsburg	Callaway	76	53	82	43	64	+8	1.42	-0.18	3345	-81
Novelty	Knox	74	51	79	43	63	+7	0.93	-0.49	3039	-290
Linneus	Linn	75	50	82	40	63	+8	0.77	-0.59	3188	-103
Monroe City	Monroe	75	52	81	42	64	+8	0.30	-0.93	3228	-219
Versailles	Morgan	78	54	83	44	65	+7	0.10	-1.73	3595	-81
Green Ridge	Pettis	77	52	81	40	64	+7	0.01	-1.71	3476	+82
Lamar	Barton	76	52	81	40	63	+4	0.09	-1.68	3684	-171
Cook Station	Crawford	76	48	82	40	62	+4	0.45	-0.77	3340	-356
Alley Spring	Shannon	77	50	81	40	62	+5	0.56	-0.83	3385	-135
Round Spring	Shannon	76	50	79	41	61	+4	0.73	-0.69	3358	-165
Mountain Grove	Wright	74	53	78	42	63	+5	0.16	-1.33	3354	-174
Delta	Cape Girardeau	*	*	*	*	*	*	*	*	*	*
Cardwell	Dunklin	80	56	86	47	67	+6	0.74	-1.06	4265	-132
Clarkton	Dunklin	80	56	85	46	67	+6	0.59	-0.55	4133	-221
Glennonville	Dunklin	79	56	84	44	67	+6	0.52	-0.58	4155	-169
Charleston	Mississippi	80	55	86	43	68	+9	0.28	-1.13	4054	+11
Portageville-Delta Center	Pemiscot	80	59	85	49	69	+8	1.00	-0.71	4363	+24
Portageville-Lee Farm	Pemiscot	80	58	85	48	69	+8	1.79	+0.19	4347	+37
Steele	Pemiscot	81	58	87	48	69	+7	0.58	-0.93	4423	+84

* Complete data not available for report

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

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