Integrated Pest & Crop Management

Good Time to Check Wheat Stands for Diseases

By Laura Sweets

The unusually mild winter in much of Missouri could have given some winter wheat diseases a slight advantage so it would be worthwhile to check wheat fields for signs of foliage diseases and virus diseases. Septoria leaf blotch, powdery mildew and leaf rust can develop on young plants during the fall months. In most years, fall infections of these diseases are minimal and cold winter temperatures prevent further disease development. This year with the unusually mild winter temperatures, it is possible that these foliage diseases could have remained active through the winter and symptoms or signs of these foliage diseases might be found if fields were scouted now.

Septoria leaf blotch lesions begin as light yellow flecks or streaks. These flecks expand into yellow to reddish brown, irregularly shaped blotches. As the lesions mature, the centers may turn lighter gray in color. Dark brown specks (fruiting bodies or pycnidia of the causal fungus, *Septoria tritici*) may be scattered within the centers of mature lesions. Lesions may coalesce killing larger areas of leaf tissue.

Powdery mildew infections begin as light green to yellow flecks on the leaf surface. As powdery mildew develops, the leaf surfaces become covered with patches of cottony white mold growth of *Erysiphe graminis* f. sp. *tritici*, the causal fungus. These patches eventually turn a grayish white to grayish brown.

Leaf rust lesions appear primarily on the upper leaf surfaces and leaf sheaths. Initially, lesions are small, yellow to light-green flecks. Eventually, leaf rust appears as small, circular to oval-shaped, orange red pustules. These pustules break open to release masses of orange red spores of *Puccinia recondita*.

Again, although these diseases may occur in the fall on young plants, typical Missouri winter temperatures usually slow or halt disease development. This year's mild winter temperatures could have allowed any disease which started last fall to remain active through the winter months and symptoms might be evident now. Leaf rust is the least likely of the three to be a problem because our inoculum for this disease comes from southern states such as Texas and Oklahoma. The drought conditions crippled those states during 2011 meaning that little leaf rust developed during the 2011 season so little inoculum was available to be wind carried to Missouri.

If any of these are present in wheat this spring, how much of a problem they will be and how much yield loss they might cause is dependent, in part, on weather conditions now through heading and harvest. These foliage diseases are favored by warm, wet or humid weather. A wet spring with frequent rains, overcast days and heavy dews is more likely to result in higher levels of disease incidence and severity and

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greater risk of yield loss. A warm, dry spring would reduce the risk of disease development and thus for yield loss. Of two recent forecasts for 2012 spring weather conditions in Missouri, one calls for a our spring to be a bit warmer and dryer than normal while the other suggests a normal to slightly wetter-than-normal spring.

Perhaps the best recommendation is to scout fields now to determine if any foliage diseases are present, to access their severity, to follow weather conditions in your area and to be prepared to apply a foliar fungicide if disease pressure and weather conditions warrant such a treatment.

The other wheat diseases which might be showing up are virus diseases such as barley yellow dwarf, wheat spindle streak mosaic and wheat soilborne mosaic. Barley yellow dwarf is the virus disease which is vectored by numerous aphid species including the oat bird cherry aphid. Symptoms may develop in the fall or early spring, especially if temperatures have been mild and aphids active. Symptoms include leaf discoloration ranging from a light green or yellowing to a red or purple discoloration of leaf tissue. Discoloration tends to be from the leaf tip down and from the leaf margin in toward the center of the leaf. Plants may be stunted or have a rigid, upright growth form. Symptoms may be more severe and yield losses higher if plants are infected in the fall or early spring. Infections developing in the late spring or summer may cause discoloration of the upper leaves, especially the flag leaf, but little stunting of plants or yield loss. At this point in the season, monitoring aphid levels and taking appropriate actions to control aphids would be the principle management strategies. Maintaining good plant vigor with proper fertility may also help minimize the impact of barley yellow dwarf.

Wheat spindle streak mosaic and wheat soilborne mosaic symptoms typically show up during spring greenup and are most pronounced when air temperatures are around 50 F. With wheat spindle streak mosaic, yellow green streaks or mottling develop on the dark green background of the leaves. These lesions usually run parallel to the leaf veins and tend to be tapered at the ends giving the lesions a spindle-shaped appearance. Plants may be slightly stunted, off-color and have fewer tillers than normal.

Wheat soilborne mosaic causes light green to yellow green to bright yellow mosaic patterns in leaf tissues. Symptoms of wheat soilborne mosaic are not always distinctive and might occur as a more general yellowing, similar to that caused by nitrogen deficiency. Infected plants may be stunted and slow to green up in the spring.

Both wheat spindle streak mosaic and wheat soilborne mosaic tend to be more severe in lower, wetter areas of fields. Symptoms of both diseases are more obvious early in the spring with cooler air temperatures and tend to fade as air temperatures increase late spring to summer. In years with extended periods of cool spring temperatures, symptoms may be evident for longer periods of time and the possibility for impact on yield may increase. Proper fertility may help reduce the impact of these virus diseases on wheat.

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Watch Out for Carryover

By Kevin Bradley

One thing corn growers should probably be aware of and look out for this spring is carryover injury from applications of herbicides that contain fomesafen. Fomesafen is the active ingredient in the herbicides Dawn, Flexstar, Prefix, Rhythm, and a variety of other generic products, and in recent years has become one of the most common active ingredients applied post-emergence for the control of glyphosate-resistant waterhemp in soybean.

Of the herbicides that we typically apply post-emergence in soybeans, fomesafen is one of the most persistent and has one of the longest periods of soil residual activity. Because of this soil persistence as well as the sensitivity of corn to fomesafen residues, the label of most fomesafen products like Flexstar and Prefix requires a 10-month rotational interval between fomesafen applications and corn planting.

There are two primary factors that influence the likelihood of fomesafen carryover injury to corn; 1) dry conditions following application, and 2) the rate and timing of the herbicide application.

Although most areas of the state received near average levels of precipitation during the fall and winter, there are some regions that have had below average levels of rainfall and snow during this same time period. Under especially dry conditions, the risk of fomesafen carryover injury to corn is much higher. Soil moisture is critically important for herbicide degradation. If adequate rainfall is not received after application, then the chemical and microbial processes responsible for herbicide degradation are reduced significantly and the herbicide molecules are more likely to become bound (adsorbed) to soil particles. All of this results in less herbicide degradation and increases the likelihood of herbicide carryover. Injury may also be more noticeable on sandy soils, as these areas are usually better drained and hold moisture for shorter periods of time.

The rate and the timing of the fomesafen application are two other factors that influence the likelihood of carryover injury to corn. Simply put, the higher the rate of fomesafen applied and the later the herbicide application was made, the greater the chance that some fomesafen may remain to cause carryover injury to corn. Since the labels of most fomesafen-

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containing products require a 10-month rotational interval between application and corn planting, late-season applications of these products in soybeans and early planting of corn the following spring can often make satisfying these intervals difficult.

The most common corn injury symptom caused by fomesafen carryover is a whitening of the leaf veins, commonly referred to as veinal chlorosis (Figures 1 and 2). Affected areas of corn leaves often take on a striped appearance, can become necrotic, and tissue near the leaf midrib may totally collapse in that region. The root system of affected plants usually remains normal.

What does all of this mean for growers who are planning to plant corn in an area that received applications of fomesafen last year? I think it means that corn growers should be more aware of the higher **potential** for herbicide carryover injury that can occur, especially in areas that have experienced dry fall and winter conditions, or in fields that received late or higher amounts of fomesafen than usual. The best practice is to follow the rotational intervals listed on the labels of the herbicides used and to consider the herbicide use history of each field in relation to the factors discussed above. If several of these factors suggest a high probability of fomesafen carryover, then it's probably a good idea to stay away from corn in these fields during the 2012 growing season.

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Aphid Populations in Wheat

By Wayne Bailey

Aphid populations are present in low numbers in some wheat fields, but have reached or exceeded threshold levels in others. Most economic infestations have been found during the past 2-3 weeks in Western and Southwest Missouri fields. Aphid numbers vary greatly between fields, so be sure to look at each field before applying insecticides. Although five species of aphids are often found in Missouri wheat fields (greenbug, bird-cherry oat, corn leaf, English grain, yellow sugarcane), at present the bird cherry-oat aphid is the one species causing problems. Because this aphid species tolerates cold conditions, it can overwinter in Missouri wheat fields. Damage from bird cherry-oat aphids may occur throughout the growing season, even during winter months. All species of aphids found on wheat damage plants by removing plant juices using their piercing-sucking mouthparts. The bird cherry-oat aphid and greenbug are the most damaging species because in addition to direct damage caused by feeding, they also transmit the viral plant pathogen yellow barley dwarf (BYD). All five aphid species reproduce parthenogenically which means they produce several generations of living young, mostly females, which are pregnant when born without mating. Occasionally males will be produced, but several generations of aphids may occur without mating taking place.

- Bird cherry-oat aphids are medium sized aphids with olive colored bodies and reddish-orange patches on back at base of cornicles (tailpipes). Antennae, eyes, and tips of legs and cornicles are black in color.
- Greenbug aphids are small pear-shaped aphid, 1/16-inch in length. Pale yellow to pale green in color with black legs, cornicles, eyes, and a predominant dark green line running down the length of the back.

The bird-cherry oat aphid and greenbug are often serious pests of small grains including wheat. Whereas the bird cherry-oat aphids may be present throughout the growing season, the greenbug usually does not overwinter in Missouri, but instead migrates into the state each spring during early season movement of storm fronts from more southern and western states. Similarly, bird cherry-oat aphids may occur over the entire plant and often be at ground level during periods of cold or windy weather. In contrast, the greenbug is generally found in colonies on leaf surfaces whenever present on the wheat plants.

Thresholds are based on the average number of aphids present per foot of row depending on plant height and stage of growth. There is much controversy as to appropriate thresholds for each of these aphid species. The use of high performance wheat varieties, the high price of wheat sold for grain, difficulties in finding certain aphids during scouting, recent research in Missouri, and many other factors suggest that our

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traditional thresholds are no longer suitable. With this in mind, our current recommendations for control of bird cherry-oat aphids and greenbug in wheat are as follows.

Bird cherry-oat aphid thresholds: Treatment is justified if 12-15 or more aphids are present per foot of row during the seedling stage in the fall through head formation the following year.

Greenbug thresholds: Scout several locations in the field to determine number of aphids present per linear foot of row. Treatment is justified if the average number of greenbug per linear foot of row are 50 or more greenbug on wheat with less than 3 tillers, 100–300 aphids or more on 3-6 inch height wheat with 3 or more tillers, or 300-500 aphids or more on 6-10 inch height wheat prior to harvest.

Regardless of aphid species present, producers should consider the number of beneficial insects present (examples: adults and larvae of pink ladybugs and other species of ladybird beetles, parasitic wasps), the stage and condition of the wheat plants, and whether the wheat is under additional stressors such as drought. The presence of high numbers of beneficial insects will increase the threshold and reduce the need for insecticides, whereas, increased stress on plants will call for lower thresholds as stressed plants are less able to withstand aphid infestations. If economic threshold levels of bird-cherry oat aphids have been reached or exceeded, use one of the following recommended insecticides. Insecticide efficacy will be greatest on days when temperatures reach 60 degrees Fahrenheit or warmer.

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INSECTICIDE RECOMMENDATIONS 2012 - WHEAT APHIDS

GREENBUG APHID - *Schizaphis graminum (Rodani);* BIRD CHERRY-OAT APHID - *Rhopalosiphum padi (L.);* ENGLISH GRAIN APHID - *Sitobion avenae (Fabricius);* CORN LEAF APHID - *Rhopalosiphum (Fitch); YELLOW SUGARCANE APHID - Sipha flava (Forbes)*

Comments: Greenbug Aphids tend to be occasional problems on winter wheat in fall of year and again the following spring when winged aphids migrate into the state from more southern locations. Treatment is justified if 25 to 50 or more aphids are present per linear foot of row during early seedling stage (1 or 2 tillers present). Later stages of wheat rarely require aphid control. Other control strategies include use of greenbug resistant wheat varieties and preservation of beneficial insect populations by avoiding nonessential insecticide applications.

Bird Cherry-oat Aphid has increased in importance in Missouri wheat during the past few years. This insect builds in numbers during fall and may transmit barley yellow dwarf virus to wheat plants during this period. It has been found overwintering in Missouri wheat fields and builds in numbers the following spring. Economic damage is mainly caused by the barley yellow dwarf virus although this aphid does suck plant juices from wheat plants by using its piercing sucking mouthpart. Recent Missouri wheat trials indicate that both fall and spring populations of this aphid can cause substantial yield reductions in some years. Based on these data, the economic threshold for bird cherry-oat aphids is to treat when 12 to 25 aphids or more per linear foot of row from seedling emergence in the fall to heading of plants the following year.

English Grain Aphid does not transmit barley yellow dwarf so damage to wheat is only through feeding which removes plant juices. The economic threshold for this aphid is to treat when populations of 100 or more aphids per tiller are present.

Corn Leaf Aphids and Yellow Sugarcane Aphids rarely reach damaging levels due to heavy mortality of these aphids from biological control agents. Corn leaf aphids are capable of transmitting the barley yellow drawf pathogen.

Common Name	Trade Name	Rate of formulated material per acre	Placement	REI Hours	Pre-Harvest Intervals Days
cyfluthrin	***Baythroid XL**	1.8 to 2.4 fl oz	foliage	12	30 (grain) 3 (grazing or forage)
dimethoate	**Dimethoate 4EC**	1 3/4 pt	foliage	48	35 (grain)
methomyl	***Lannate SP**	1/4 to 1/2 lb	foliage	48	7 (grain) 10 (grazing or forage)
zeta-cypermethrin	***Mustang Max**	3.2 to 4.0 fl oz	foliage	12	14 (grain, forage, hay)
microencapsulated methyl parathion	***Penncap-M**	2 to 3 pt	foliage	48	15 (harvest or grazing)
chlorpyrifos	***Nufos 4E**	1/2 to 1 pt	foliage	24	28 (grain or straw) 14 (forage or hay)
cyfluthrin	***Tombstone Helios**	1.8 to 2.4 fl oz	foliage	12	30 (grain) 7 (grazing)
lambda-cyhalothrin	***Warrior II with Zeon**	1.28 to 1.92 fl oz	foliage	24	30 (grain, hay, straw)
Seed Treatments imidacloprid thiamethoxam	**Gaucho** **Cruiser**	See product label See product label	Commercially on seed Commercially on seed		

***Designates a restricted-use pesticide. Use is restricted to certified applicators only. Read the label to determine appropriated insecticide rates. Be sure to follow all label directions, precautions, and restrictions.**

Weed of the Month: Poison Hemlock

By Doug Spaunhorst and Kevin Bradley

One of the first weeds that you can see "greening-up" right now along roadsides, pastures, and a lot of other areas is poison hemlock (Conium maculatum L.). Poison hemlock is an erect biennial or perennial plant that typically ranges from 4 to 6 feet in height and is primarily a weed of roadsides, pastures, fencerows, and non-crop areas, but in recent years has been found as a weed in no-till corn and soybean fields as well.

Figure 1. Poison hemlock infestations like this one have been common in pastures and roadsides, but in recent years this plant has also appeared as a weed of no-till cropping systems.

Poison hemlock develops into a basal rosette during the first year of growth (Figures 1 and 2) and then produces an erect vegetative stem and flowers during the second year of growth (Figure 3). Stems are smooth, covered with purple spots, and are hollow except at the nodal regions. Poison hemlock flowers are white and arranged as compound umbels that usually range from 7 to 15-inches in width. Poison hemlock leaves are arranged alternately along the stem and are often glossy in appearance. Upon closer examination, you will see that each leaf is divided into pairs of opposite leaflets that each measure 4- to 10-mm in length (Figure 4). Poison hemlock can produce as many as 38,000 seed per plant (Whittet 1968), with seed dispersal generally occurring when the plants are mowed.

Poison hemlock produces many chemicals that can be toxic to both humans and animals. The most toxic compounds produced by poison hemlock are coniine and y-coniceine, which are alkaloids that primarily affect the reproductive and central nervous systems (Sheley and Pertroff 1999). Coniine is the alkaloid present in the greatest abundance in mature plants and seeds. However, in the early vegetative stages of growth, approximately 98% of the total alkaloids present are y-coniceine (Panter et al. 1988a). This is significant in that y-coniceine is about 8 times more toxic than coniine; therefore consumption of young poison hemlock plants can lead to significant problems (Panter and Keeler 1988). Livestock that are affected the most by poison hemlock consumption are cattle, horses, and goats; sheep and swine are less sensitive due to their liver's ability to metabolize the plant's toxic compounds more efficiently (Cheeke and Shull 1985). Fresh poison hemlock tissue has been reported to be lethal at amounts ranging from 2 to 6 grams of plant material per pound of body weight in cattle, sheep, and pigs (Keeler and Balls 1978; Panter et al. 1988a). Symptoms of poison hemlock consumption and poisoning include dilation of the pupils, reduced heart rate, coma, trembling, nervousness, and respiratory paralysis, which may eventually lead to death (Panter et al. 1988b). The rates at which livestock are affected varies; cattle and sheep are usually affected within a couple hours, while horses may show symptoms within 30 to 40 minutes (Vetter 2004; Cheeke and Shull 1985).

Figure 2. Poison hemlock in the rosette stage of growth.

Figure 3. Mature poison hemlock plants in the second year of growth.

Non-chemical options for the control of poison hemlock include hand-weeding, mowing, and tillage. Growth regulator herbicides and products that contain 2, 4-D, dicamba, or 2, 4-D plus triclopyr are all effective in controlling poison hemlock in a grass

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Figure 4. Poison hemlock leaves are divided into pairs of oppositely arranged leaflets.

pasture or hayland setting. Glyphosate (sold as Roundup or a variety of other trade names) also has some activity on poison hemlock. In no-till corn or soybean fields, glyphosate plus 2, 4-D or glyphosate plus dicamba should be considered for the burndown of this weed prior to planting. Weed scientists at Purdue University have found that dicamba plus glyphosate may offer more consistency and higher levels of poison hemlock control than applications of glyphosate plus 2, 4-D (Nice et al. 2005). The key to the chemical control of poison hemlock plants in any setting is to apply the herbicide when plants are young and in the rosette stage of growth, rather than when bolting and stem elongation has occurred. Once the central stems are present that will eventually support flower and seed production, control of these plants with any herbicide is likely to diminish. In most areas of Missouri, poison hemlock is in the rosette stage right now and has not yet begun to bolt, although this will likely occur soon if we continue to experience above-average temperatures. So, as long as temperatures remain around 50° or so for at least a couple of hours following herbicide application, then now is the time to treat.

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Weather Data for the Week Ending February 28, 2012

By Pat Guinan

Station	County	Weekly Temperature (°F)						Monthly Precipitation (in.)		Growing Degree Days‡	
		Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	February 1-28	Departure from long term avg.	Accumulated Since Apr.1	Departure from long term avg.
Corning	Atchison	51	29	61	18	41	+7	1.79	+0.87	*	*
St. Joseph	Buchanan	51	31	62	21	41	+6	2.57	+1.48	*	*
Brunswick	Carroll	54	32	63	21	42	+7	2.00	+0.29	*	*
Albany	Gentry	51	28	62	19	39	+6	1.98	+0.74	*	*
Auxvasse	Audrain	56	31	67	22	43	+7	2.09	+0.14	*	*
Vandalia	Audrain	54	31	65	23	41	+6	1.78	-0.18	*	*
Columbia-Bradford Research and Extension Center	Boone	55	31	68	22	43	+5	2.09	-0.21	*	*
Columbia-Capen Park	Boone	57	30	68	25	43	+5	2.46	+0.19	*	*
Columbia-Jefferson Farm and Gardens	Boone	56	32	68	23	44	+6	2.18	-0.11	*	*
Columbia-Sanborn Field	Boone	56	34	66	25	45	+7	2.47	+0.14	*	*
Columbia-South Farms	Boone	56	32	66	23	44	+6	2.35	+0.03	*	*
Williamsburg	Callaway	57	32	69	24	43	+7	2.07	-0.28	*	*
Novelty	Knox	50	30	60	20	39	+5	1.41	-0.27	*	*
Linneus	Linn	52	30	62	20	41	+7	2.27	+0.82	*	*
Monroe City	Monroe	53	30	63	22	40	+5	1.09	-0.58	*	*
Versailles	Morgan	58	35	69	24	46	+7	2.24	+0.07	*	*
Green Ridge	Pettis	56	33	67	24	44	+7	2.52	+0.65	*	*
Lamar	Barton	59	35	67	25	47	+6	2.63	+0.35	*	*
Cook Station	Crawford	60	29	73	25	45	+5	1.69	-0.75	*	*
Round Spring	Shannon	62	27	75	23	44	+4	0.22	-2.25	*	*
Mountain Grove	Wright	59	36	70	28	47	+8	1.73	-1.11	*	*
Delta	Cape Girardeau	60	34	71	29	47	+6	1.98	-1.33	*	*
Cardwell	Dunklin	64	38	76	32	51	+7	1.94	-1.80	*	*
Clarkton	Dunklin	63	36	75	30	50	+7	1.82	-1.47	*	*
Glennonville	Dunklin	63	37	74	32	51	+8	2.22	-1.03	*	*
Charleston	Mississippi	62	35	74	28	49	+6	1.57	-2.23	*	*
Portageville-Delta Center	Pemiscot	64	40	75	33	51	+7	2.02	-1.81	*	*
Portageville-Lee Farm	Pemiscot	64	39	75	33	52	+9	1.98	-1.76	*	*
Steele	Pemiscot	64	39	75	33	52	+8	1.80	-2.10	*	*

‡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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