Issue 1009

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eUpdate

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These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate 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 Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Controlling weeds after wheat harvest

The 2024 wheat harvest is well underway, so it is time to think about weed control in wheat stubble. Weeds that have been suppressed by the canopy will grow rapidly once crop competition is removed. In addition, weeds that have emerged through the wheat canopy will be damaged during harvest and will quickly begin regrowth. Delaying control can result in lost soil moisture that could be used for crop production, as well as weed seed production which will cause difficulties in the future.

When thinking about weed control in wheat stubble, there are two priorities – controlling already emerged weeds and preventing later flushes. Making applications before weeds exceed 4 to 6 inches is necessary for good control of already emerged weeds (Figure 1). Residual herbicides are needed to reduce the number of herbicide applications needed to control multiple flushes of weeds.

Figure 1. This large Palmer amaranth is regrowing after being sprayed with paraquat. Photo by Sarah Lancaster, K-State Research and Extension.

Despite a growing number of herbicide-resistant weeds, glyphosate plus 2,4-D LVE and/or dicamba remain important for weed control in wheat stubble. However, these herbicides alone are not likely to provide adequate control of pigweeds or kochia, especially when applied in the hot, dry

conditions that are common after wheat harvest. Strategies for more successful herbicide applications in high temperatures were discussed in the article published last week. The following paragraphs list some herbicide options commonly used to control weeds after wheat harvest.

Paraquat (Gramoxone, others) is a Group 22 herbicide that can work well in place of glyphosate to control emerged pigweed and kochia. Paraquat is a contact herbicide, so spray coverage is critical. Spray volumes of 20 gallons/acre or higher are preferred, especially on larger weeds or denser stands. If sprayed at less than 20 GPA, flat fan nozzles are required. Paraquat needs to be applied with a non-ionic surfactant or oil concentrate to enhance the surface coverage of the plant foliage. Also, remember that there is a requirement for handlers and applicators to complete training every three years to use paraquat.

If planning to plant corn or sorghum next spring, a tank mix of paraquat with **atrazine** (Group 5) will enhance the control of emerged weeds and provide some residual weed control. Atrazine labels have recently changed so that the only noncrop uses of atrazine permitted are in wheat-fallow-wheat, wheat-corn-fallow, and wheat-sorghum-fallow rotations. In these rotations, it is still important to be aware of the total amount of atrazine you are applying to each field in a given year and stay below the maximum rate allowed for your field. **Metribuzin** is another Group 5 herbicide that can be used instead of atrazine to enhance control and provide some residual activity. There are two benefits of using metribuzin instead of atrazine. First, there are more options for crop rotation. Atrazine limits crop options to corn or sorghum in the next season, whereas metribuzin can be applied as a preemergence herbicide for soybeans or field peas. Second, metribuzin is likely unaffected by enhanced degradation associated with extensive atrazine use.

One final note regarding paraquat. Limited research out of Australia suggests applying paraquat 2 weeks after a glyphosate application will increase weed control. This is called a 'double knock' strategy. This information is included here not as a recommendation per se but to encourage careful thought about when you want to utilize contact herbicides in your fallow weed management system. If paraquat were sprayed with or before glyphosate, the rapid damage to leaf tissue will prevent uptake and translocation of glyphosate. However, if a glyphosate application partially controls weeds, there will be sufficient leaf area 2 weeks after application for paraquat to be effective.

Saflufenacil (Sharpen) is a Group 14 herbicide applied at one to two fluid ounces per acre is an option to provide postemergence and short-term residual control of Palmer amaranth, kochia, and other broadleaf weeds. Sharpen should be applied with glyphosate for grass control, and can be applied with other products labeled for use in wheat stubble, but do not apply Sharpen with Valor. Sharpen works best with the addition of methylated seed oil *and* ammonium sulfate. Good spray coverage is needed, so using 15 to 20 gallons/acre spray solution is important. Be sure to note crop rotation intervals for your situation, especially if using more than one fluid ounce per acre or applying to sandy or low organic matter soils. **Tiafenacil (Reviton)** is a Group 14 that is very similar to Sharpen in terms of weed control and adjuvant use.

Flumioxazin (Valor, others) is a Group 14 herbicide that can be added to burndown treatments at rates of one to four fluid ounces per acre for activity on emerged broadleaf weeds and some residual activity on broadleaf and grass weeds in wheat stubble. Flumioxazin can be mixed with glyphosate or clethodim (Select Max) for enhanced grass control. It can also be mixed with 2,4-D, atrazine, metribuzin, or paraquat. Wheat can be planted 30 days after two fluid ounces per acre or 60 days after three fluid ounces per acre if at least one inch of rain occurs between application and planting. Soybeans can be planted immediately after applying three fluid ounces per acre. Corn, sorghum,

cotton, sunflowers, or soybeans can be planted in the spring after applying four fluid ounces per acre. Residual weed control with flumioxazin will depend on rainfall (0.25 inch) for activation, just as with pre-plant treatment in soybeans. Of the three Group 14 herbicides discussed, flumioxazin is the only herbicide with meaningful residual activity; however, saflufenacil provides greater kochia control than flumioxazin.

For more detailed information, see the "2024 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide available online at https://www.bookstore.ksre.ksu.edu/pubs/CHEMWEEDGUIDE.pdf or check with your local K-State Research and Extension office for a paper copy.

The use of trade names is for clarity to readers and does not imply endorsement of a particular product, nor does exclusion imply non-approval. Always consult the herbicide label for the most current use requirements. Users should read and follow all label directions.

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2. Late-season herbicide applications in corn

Some questions have recently come in looking for herbicide options for corn in later vegetative stages. Adequate pre-emergence herbicides were applied; however, excessive rainfall and sandy soils resulted in weed emergence. While early-season weed control is critical to protect yield potential, in some situations, late-season weed control may be needed to protect yield, prevent harvest difficulties, and reduce additions to the weed seed bank.

Table 1 lists products that can be applied to corn over 12 inches tall to control emerged weeds. Note that some of these products recommend or require drop nozzles to reduce crop injury and get better spray coverage on weeds that are shorter than the crop. Also of note, strategies for more successful herbicide applications in high temperatures were discussed in an eUpdate article published on June 13.

Table 1. Herbicides labeled for corn over 12 inches tall to control emerged weeds.

Herbicide (group)	Product	Maximum corn height	Comments
Glufosinate	Liberty, others	V6	
Tolpyralate	Shieldex	V6 or 20 inches	Can mix with Tough to enhance control
Clopyralid	Stinger, others	24 inches	Fair to good pigweed control
Topramezone	Armezon, Impact	V8	Can mix with Tough to enhance control
Pyridate (6)	Tough	V8	Can be used to enhance Group 27 herbicides
Mesotrione (27)	Callisto, others	V8 or 30 inches	Can mix with Tough to enhance control
Glyphosate	Many	V8 or 30 inches	RR2 hybrids use drop nozzles 30 to 48 inches
Nicosulfuron (2)	Accent	36 inches	Use drop nozzles >20 inches
Tembotrione (27)	Laudis	V9	Can mix with Tough to enhance control
Carfentrazone (14)	Aim	14 leaves	Use drop nozzles > 8 leaves
Bromoxynil	Moxy, others	tasselling	Fair pigweed control
Dicamba	Clarity others	tasselling	Fair to good crop safety
	DiFlexx	V10	Good crop safety
	Status	V8 or 30 inches	Good to excellent crop safety
2,4-D (4)	Amine or ester	tasselling	Use drop nozzles if corn >8 inches
	Enlist One	V8 or 30 inches	

For more detailed information, see the "2024 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide available online at https://www.bookstore.ksre.ksu.edu/pubs/CHEMWEEDGUIDE.pdf or check with your local K-State Research and Extension office for a paper copy.

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nor does exclusion imply non-approval. Always consult the herbicide label for the most current use requirements. Users should read and follow all label directions.

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3. Plant analysis for testing nutrient levels in corn

Plant analysis is an excellent in-season "quality control" tool. It can be especially valuable for managing secondary and micronutrients that do not have high-quality, reliable soil tests available and for providing insight into how efficiently you are using applied nutrients.

Kansas farmers can use plant analysis in two basic ways: for **diagnostic** purposes and for **monitoring** nutrient levels at a common growth stage. Diagnostics can be done at any time but are especially valuable early in the season when corrective actions can easily be taken. Monitoring is generally done at the beginning of reproductive growth.

General sampling guidelines:

- Plants are less than 12 inches tall: Collect the whole plant; cut the plant off at ground level.
- Plants more than 12 inches tall and until reproductive growth begins: Collect the top fully developed leaves (those which show leaf collars).
- After reproductive growth starts: Collect the ear leaves (below the uppermost developing ear); samples should be collected randomly from the field at silk emergence.

Figure 1. Corn sampling during different growth stage. Photos by Dorivar Ruiz Diaz, K-State Research and Extension.

Plant analysis for diagnostic sampling

Collecting specific plant parts is less important when sampling for diagnostic purposes than obtaining comparison samples from good and bad areas of the field.

Plant analysis is an excellent diagnostic tool to help understand some of the variation among corn plants in the field. When using plant analysis to diagnose field problems, try to take comparison samples from both good/normal areas of the field and problem spots. This can be done at any growth stage.

Along with taking plant tissue samples, collecting a soil sample from both good and bad areas is also helpful when doing diagnostics. Define your areas, and collect both soil and plant tissue from areas that represent good and bad areas of plant growth. Soil samples can help define why a problem may be occurring. The soil sample may find certain nutrient levels are very low in the soil, helping to explain why a deficiency is occurring. However, other factors can also cause nutrient problems. Soil compaction, or saturation of soils, for example, often limits the uptake of nutrients, especially potassium, which are otherwise present in adequate amounts in the soil.

Plant analysis for nutrient monitoring

Plant leaves should be collected as the plant enters reproductive growth for general monitoring or quality control purposes. Sampling under stress conditions for monitoring purposes can give misleading results and is not recommended. Stresses such as drought or saturated soils will generally limit nutrient uptake and result in a general reduction in nutrient content in the plant.

How should you handle collected samples, and where should you send them?

The collected leaves should be allowed to wilt overnight to remove excess moisture, placed in a paper bag or mailing envelope, and shipped to a lab for analysis. Do not place the leaves in a plastic bag or other tightly sealed container, as the leaves will begin to rot and decompose during transport, and the sample won't be usable. Most soil testing labs in the region provide plant analysis services, including the K-State Testing Lab. For questions about the plant tissue testing services at the K-State Testing Lab, email soiltesting@ksu.edu or call 785-532-7897.

What nutrients should be included in the plant analysis?

In Kansas, nitrogen (N), phosphorus (P), potassium (K), sulfur (S), zinc (Zn), chloride (Cl), and iron (Fe) are the nutrients most likely to be found deficient. Recently, questions have been raised concerning copper (Cu), manganese (Mn), and molybdenum (Mo), though widespread deficiencies of those micronutrients have not been found in the state. Normally, the best values are the "bundles" or "packages" of tests offered by many labs. They can be as simple as N, P, and K, or they can be all the mineral elements considered essential to plants. K-State offers a package that includes N, P, K, Ca, Mg, S, Fe, Cu, Zn, and Mn.

What will you get back from the lab?

The data returned from the lab will be reported as the concentration of nutrient elements, or potentially toxic elements, in the plants. Units reported will normally be in "percent" for the primary and secondary nutrients (N, P, K, Ca, Mg, S, and Cl) and "ppm" (parts per million) for most of the micronutrients (Zn, Cu, Fe, Mn, B, Mo, and Al).

Most labs/agronomists compare plant nutrient concentrations to published *sufficiency ranges*. A sufficiency range is simply the range of concentrations normally found in healthy, productive plants during surveys. It can be thought of as the range of values optimum for plant growth. The medical profession uses a similar range of normal values to evaluate blood work. The sufficiency ranges change with plant age (generally being higher in young plants), vary between plant parts, and can differ between hybrids. A value slightly below the sufficiency range does not always mean the plant is deficient in that nutrient. It is an indication that the nutrient is relatively low. Values on the low end of the range are common in extremely high-yielding crops. However, if that nutrient is significantly

below the sufficiency range, you should ask some serious questions about the availability and supply of that nutrient.

Remember that any plant stress (drought, heat, soil compaction, saturated soils, etc.) can seriously impact nutrient uptake and plant tissue nutrient concentrations. A low value in the plant does not always mean the soil is low in the nutrient and that the plant will respond to fertilizer. It may be that the nutrient is present in adequate amounts in the soil but is either unavailable or not being taken up by the plant for various reasons. Two examples are drought, which can reduce plant uptake of nutrients and cause low nutrient values in the plant, and high-pH soils, which can cause low iron availability.

Conversely, levels above "sufficiency" can also indicate problems. High values might indicate over-fertilization and luxury consumption of nutrients. Plants will also sometimes try to compensate for a shortage of one nutrient by loading up on another. This sometimes occurs with nutrients such as iron, zinc, and manganese.

Table 1 gives the range of nutrient contents considered normal or "sufficient" for corn seedlings below 12 inches tall and for the ear leaf of corn at silking. Remember, these are the ranges normally found in healthy, productive crops.

Table 1. The range of nutrient contents considered "normal" or "sufficient" at two growth stages in corn.

Nutrient	Unit	Whole Plant (<12 inches tall)	Corn Ear Leaf at Green Silk
Nitrogen (N)	%	3.5-5.0	2.75-3.50
Phosphorus (P)	%	0.3-0.5	0.25-0.45
Potassium (K)	%	2.5-4.0	1.75-2.25
Calcium (Ca)	%	0.3-0.7	0.25-0.50
Magnesium (Mg)	%	0.15-0.45	0.16-0.60
Sulfur (S)	%	0.20-0.50	0.15-0.50
Chloride (Cl)	%	Not established	0.18-0.60
Copper (Cu)	ppm	5-20	5-25
Iron (Fe)	ppm	50-250	20-200
Manganese (Mn)	ppm	20-150	20-150
Zinc (Zn)	ppm	20-60	15-70
Boron (B)	ppm	5-25	4-25
Molybdenum (Mo)	ppm	0.1-10	0.1-3.0
Aluminum (Al)	ppm	<400	<200

Summary

Plant analysis is a good tool for monitoring the effectiveness of your fertilizer and lime program and a very effective diagnostic tool. Consider adding this agronomic practice to your toolbox.

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4. Wheat harvest: Identifying disease problems and setting harvest priorities

As the wheat harvest in Kansas is in full swing, it's crucial to remember the diseases that can impact grain quality or the viability of seed. By now, most disease management decisions have been made, but it's not too late to implement strategies to mitigate losses on heavily infected fields. Moreover, it's the right time to consider variety selection and seed preparation for the next season, which can significantly influence the future of your crop.

Black point and sooty molds

With recent rains slowing the progress of wheat harvest, some areas of the state are reporting sooty molds and grain with a discoloration known as black point. Both of these problems are caused by molds that grow on mature wheat.

These molds are normally not aggressive pathogens in wheat, but they can rapidly colonize mature plants. These diseases are most problematic when rain re-wets mature plants and causes harvest delays. Sooty molds are often a cosmetic problem because the mold growth is very superficial on the chaff and glumes (Figure 1). If the timing of the rain coincides with the late stages of kernel development, the molds can begin to colonize the outer layers of the wheat kernel, resulting in a gray-black discoloration called black point (Figure 2). Commonly, the embryo end of the kernel is most discolored, but entire kernels can become gray or black as a result of the black point. There is no way to manage this disease as all fungicides are long past labeled application windows. Although not typically yield limiting, the fungi that cause black point can cause problems with germination and may reduce seedling vigor. Seed lots with symptoms of black point should be tested for germination. If black point is causing germination problems, fungicide seed treatments can often improve the germination and ensure good stand establishment.

Figure 1. Wheat head with symptoms of sooty mold. Photo by Erick DeWolf, K-State Research and Extension.

Figure 2. Wheat kernels showing symptoms of black point. In severe cases, the entire kernel may appear darkened. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Fusarium head blight (scab)

Fusarium head blight (scab) has been reported in some Kansas counties where wet weather was present during and after flowering. This disease (Figure 3) can lead to lightweight, damaged kernels (Figure 4), which may contain the mycotoxin deoxynivalenol (DON). DON is sometimes referred to as "vomitoxin" because it can lead to vomiting and feed refusal in animals and is strictly regulated in finished products destined for human consumption.

Fields known to have high levels of Fusarium head blight should be harvested separately from

unaffected fields when possible. It may be prudent to harvest infected fields as early as possible to avoid further accumulation of DON in grain. Producers should carefully consider if they want to blend seed from infected and uninfected fields, as this may result in reduced quality of uninfected grain. Research has indicated that adjusting combine fan speeds may help 'blow out' lightweight Fusarium damaged kernels. Fan speeds that are too high, however, may remove too much healthy grain. Additionally, blowing out scabby kernels may increase the abundance of volunteer wheat.

If you consider saving seed from affected fields, the seed should be professionally cleaned. The pathogen that causes Fusarium head blight can result in seedling disease and decreased emergence. If seed from fields with Fusarium head blight is saved, a seed treatment can improve emergence as these scabby seeds can result in seedling blights. Planting infected seed will not result in head blight symptoms at heading in subsequent seasons.

Figure 3. Symptoms of Fusarium head blight (head scab) appear as bleached spikelets

anywhere on the head and will spread through the head when conditions are favorable. When there is high humidity, orange-colored fungal structures can be seen in some infected heads. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Figure 4. Chalky wheat kernels resulting from a severe infection of Fusarium head blight. Photo by Erick DeWolf, K-State Research and Extension.

Common bunt (stinking smut)

Common bunt is typically only detected at harvest when grain appears to have a black, dusty appearance. Grain may also have a foul, "fishlike" odor. Infection actually occurs in the fall, when wheat seeds infested with spores germinate however, symptoms are not present until the dough growth stages. Kernels infected by common bunt are dark and discolored and are filled with black spores called teliospores (Figure 5). Teliospores can be released when wheat is harvested and, in severe cases, may cause a black cloud behind the combine. Heavily infected fields can have reduced grain quality and yield. Very 'smutty' grain can be discounted. The best way to manage common bunt is to purchase certified, fungicide-treated seed or to have saved seed commercially cleaned and fungicide treated.

Figure 5. Wheat infected with common bunt. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Loose smut

Loose smut can be easily identified after heading by masses of black spores that appear on heads in place of spikelets (Figure 6). By harvest, most of the black, powdery spores have been blown away by wind, leaving only the central stem of the head (rachis). Individual heads with loose smut will not produce any grain. Earlier in the growing season, spores from infected heads may have spread to neighboring plants and infect developing seed. Cool, wet weather during the flowering period favors disease spread. Although this disease will not affect grain quality in the current season, the disease can persist within the infected kernels if the grain is saved for seed. The best option for controlling infected seeds is using a fungicide seed treatment. Coverage is key to ensuring the success of the treatment. More information about wheat seed treatment options can be found in this K-State wheat seed treatment publication: https://bookstore.ksre.ksu.edu/pubs/MF2955.pdf.

Figure 6. Loose smut symptoms caused by the fungus Ustilago tritici**. Photo by Kelsey Andersen Onofre, K-State Research and Extension.**

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5. Update - Tar Spot is now active in four counties in northeast Kansas

Tar spot of corn, a disease caused by the fungus *Phyllachora maydis*, was confirmed in several fields in four counties: Doniphan (5/27/2024), Atchison (6/4/2024), Jefferson (6/14/2024), and Nemaha (6/18/2024). (Figure 1). This report is about a month earlier than the 2023 season. Now is the time to intensify scouting efforts. If you wait until significant disease is in the upper canopy, a fungicide application may be too late. The early disease onset we're observing this year raises concerns about yield loss. Generally, early observations of tar spot have corresponded with high yield loss. The recent rains likely helped to promote tar spot development.

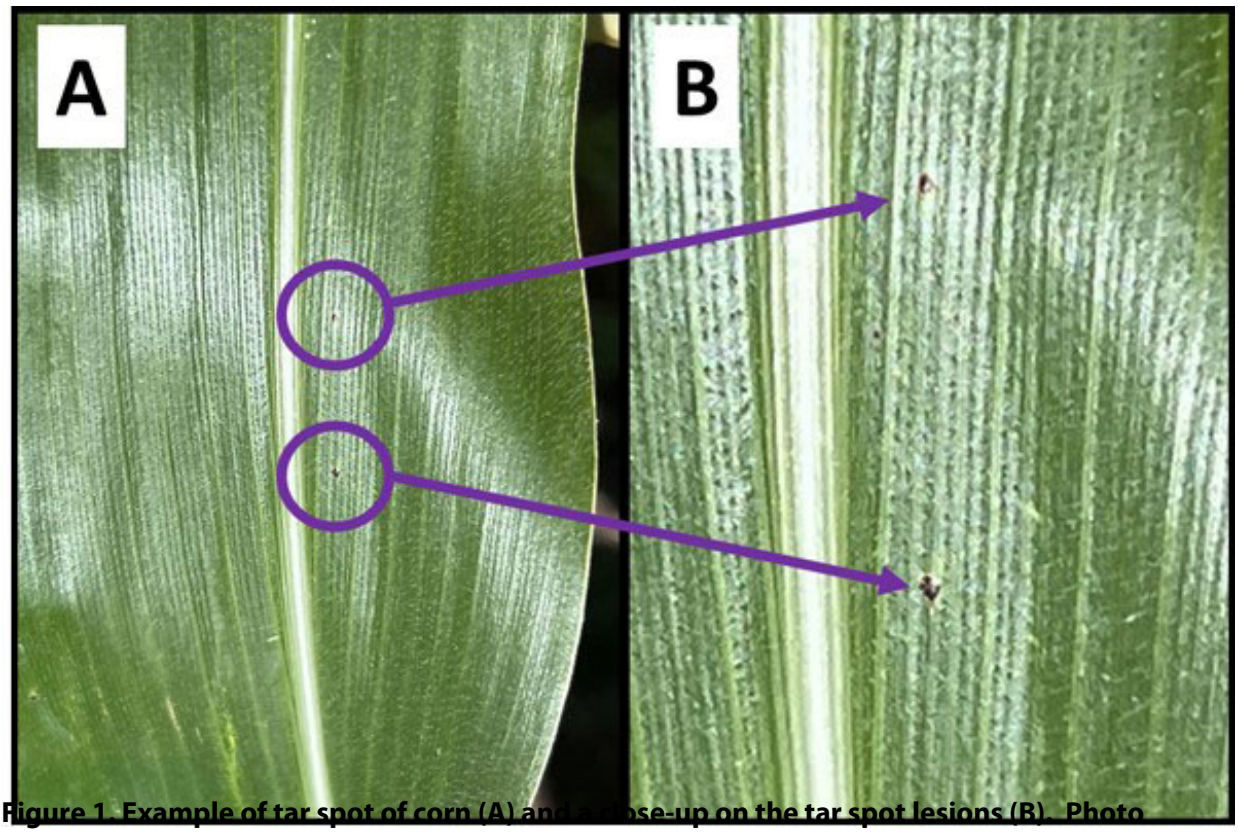

Figure 1. Example of tar spot of corn (A) and a close-up on the tar spot lesions (B). Photo courtesy of Rodrigo Onofre, K-State Research and Extension

Frequently Asked Questions about Tar Spot

What am I scouting for?

Tar spot develops as small, black, raised spots (circular or oval) that develop on infected plants, and may appear on one or both sides of the leaves, leaf sheaths, and husks. Spots may be found on healthy (green) and dying (brown) tissue. Tar spot can be easily confused with insect poop, which can appear as black spots on the surface of the leaf. If you would like assistance in confirming tar spot, you can contact Rodrigo Onofre at 785-477-0171, your local county extension office, or the K-State plant diagnostic clinic (https://www.plantpath.k-state.edu/extension/plant-disease-diagnostic-lab/).

Is there a history of disease in this field or neighboring fields?

Tar spot overwinters in infested corn residue on the soil surface, which serves as a source of inoculum for the subsequent growing season. Spores can be dispersed by wind and rain splash and can move to nearby fields if conditions are favorable.

What counties and when was Tar Spot reported in Kansas during the 2023 corn season?

During the 2023 corn season Tar spot was confirmed in Doniphan (6/26/2023), Atchison (6/30/2023), Jefferson (6/30/2023), Brown (7/05/2023), Nemaha (7/28/2023), Jackson (8/8/2023), Marshal (8/22/2023), Leavenworth (8/28/2023), Pottawatomie (9/8/2023), Wabaunsee (9/8/2023), Washington (9/21/2023), and Douglas (9/21/2023) counties. Overall, during the 2023 season, Tar spot prevalence and severity were much higher than in the 2022 season, which led to severe yield impact in several fields in the northeast part of Kansas.

What growth stage is the field?

Research has shown that making an application just after first detection and at or after VT is effective if lesions are detected early. If you wait until there is significant disease in the upper canopy, a fungicide application may be too late. Here you can find a guide for growth stages in corn: https://bookstore.ksre.ksu.edu/pubs/MF3305.pdf

How does moisture influence disease development?

The recent rains likely helped to promote tar spot development. Additionally, irrigated corn may be at particularly high risk for yield or silage loss. Forecasted rainfall and high humidity will favor tar spot development and spread.

Should I apply a fungicide?

Fungicides are an effective tool for controlling tar spot if they are timed well. Research has shown the best return on investment from a fungicide application on corn occurs when **fungal diseases are active** in the corn canopy. A **well-timed, informed fungicide application** will be important to reduce disease severity when needed, and we recommend holding off until the disease is active in your field and corn is at least V10 growth stage. Scouting will be especially important if wet weather continues. There are several fungicides that are highly effective at controlling tar spot when applied from tassel (VT) to R2 (milk).

I would recommend picking a product with multiple modes of action. The National Corn Disease Working Group has put together efficacy ratings for fungicides labeled for the control of tar spot, which can be found at the Crop Protection Network website at https://cropprotectionnetwork.org/publications/fungicide-efficacy-for-control-of-corn-diseases.

If there is high disease pressure early in the season, a second application may be warranted. Fields should be scouted 14-21 days after the first application to see if tar spot has become active again. Fungicides will not provide benefits after R5. Always consult fungicide labels for any use restrictions before application.

Where has tar spot been reported in the 2024 season?

Tar Spot has been detected in four counties in northeast Kansas: Doniphan, Atchison, Jefferson, and Nemeha (Figure 2).

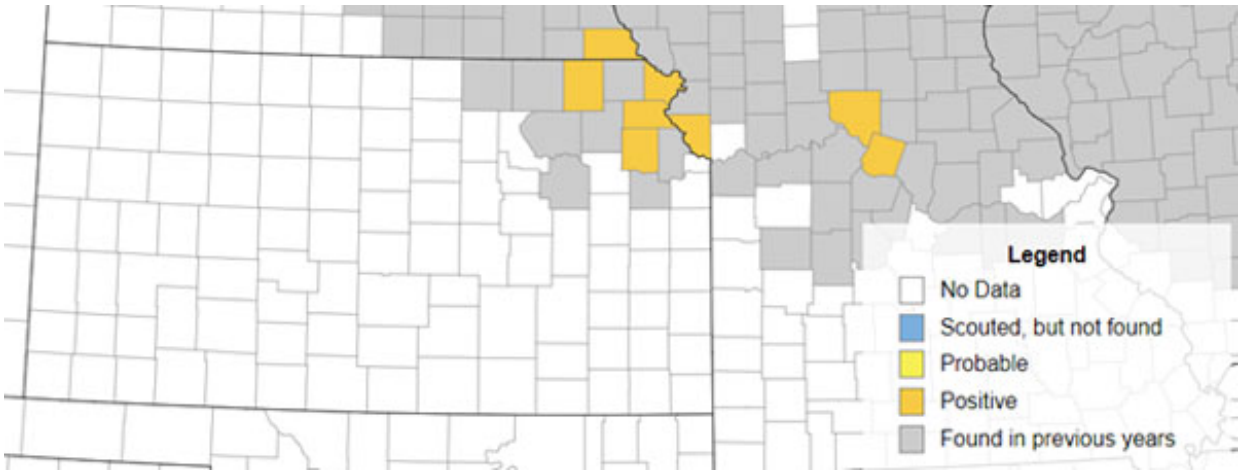

Figure 2. Tar Spot of Corn (Phyllachora maydis**) in Kansas in 2024. Source:** https://corn.ipmpipe.org/tarspot/

Please help us track tar spot!

If you suspect a field has tar spot, contact Rodrigo Onofre directly at 785-477-0171 and/or submit a sample to the K-State Plant Disease Diagnostic Lab at https://www.plantpath.k-state.edu/extension/diagnostic-lab/documents/2021_PP_DiseaseLabChecksheet.pdf.pdf. This will help us monitor the situation in the state.

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6. Fungicide considerations for corn diseases in 2024

We are entering the time window in Kansas when corn producers should be scouting fields and assessing the need for a foliar fungicide application. Several fields in eastern Kansas are approaching the V14-VT (tassel) development stage.

Now is the time to be out scouting for the following fungal diseases of corn:

- **Southern Rust (Figure 1, left)**
- **Common Rust (Figure 1, right)**
- **Gray Leaf Spot (Figure 2)**
- **Tar Spot (Figure 3)**

Southern rust scouting. Southern rust is typically first reported in Kansas in mid-July. Pustules appear on the upper leaf surface, unlike common rust, which can be found on either side of the leaf (Figure 1). The pustules are scattered on the leaf surface, and spores appear orange and rub off on fingers (and clothes!). Severe infections can be seen on the leaf sheaths.

Figure 1. Typical symptoms of southern rust (left) and common rust (right). Photo courtesy of Rodrigo Borba Onofre, Department of Plant Pathology, K-State Research and Extension.

Gray leaf spot scouting. Begin scouting for gray leaf spot in corn about two weeks before expected tassel emergence. Gray leaf spot is characterized by rectangular lesions that are 1-2 inches long and cover the entire area between the leaf veins (Figure 2). Early lesions are small, necrotic spots with yellow halos that gradually expand to full-sized lesions. Lesions are usually tan in color but may turn gray during foggy or rainy conditions. The key diagnostic feature is that the lesions are usually very rectangular in shape.

Figure 2. Gray leaf spot lesions are rectangular in shape and delimited by leaf veins. Photo courtesy of Rodrigo Onofre, Department of Plant Pathology, K-State Research and Extension.

Tar spot scouting. Tar spot is now active in several corn fields in the northeast corner of Kansas. To date, it has been reported in Atchison, Doniphan, Jefferson, and Nemaha counties in Kansas. Tar spot lesions are black, raised, and have a round/elliptical shape (Figure 3). Irrigated corn may be at particularly high risk for yield or silage loss.

More information on tar spot is available in a separate article in this eUpdate issue.

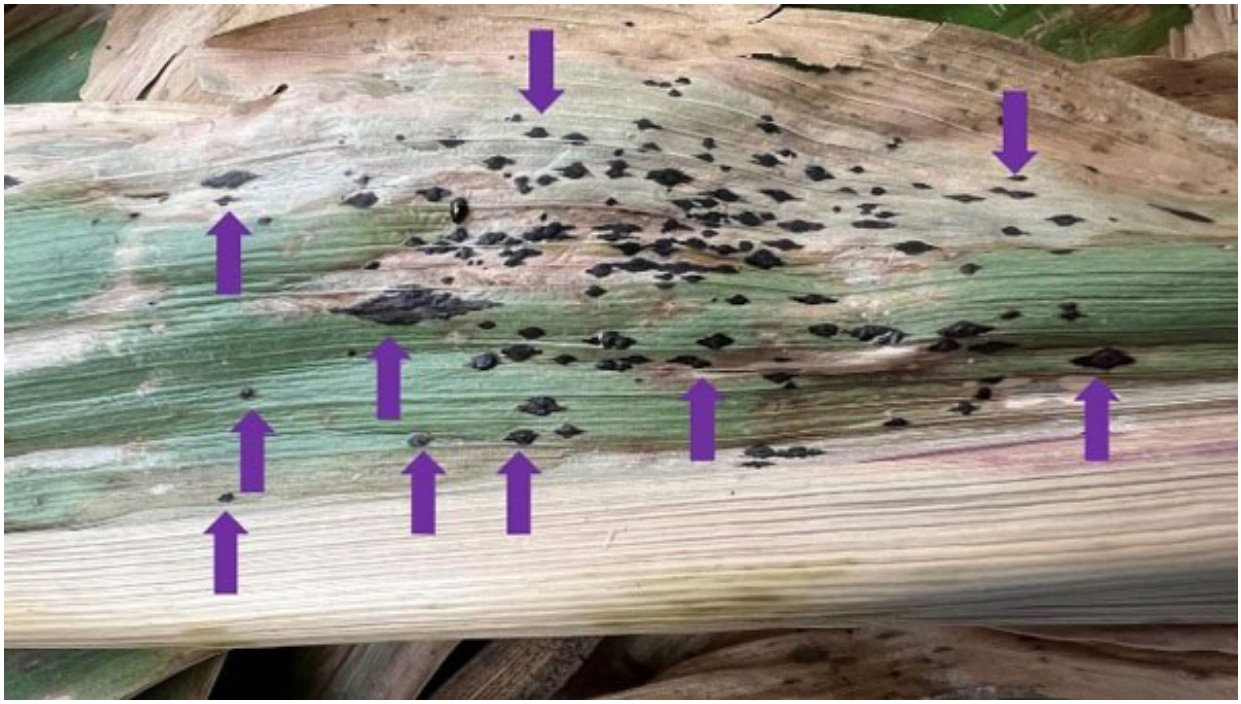

Figure 3. Tar spot of corn. Purple arrows are indicating a few of the tar spot lesions. Photo courtesy of Rodrigo Onofre, Department of Plant Pathology, K-State Research and Extension.

For confirmation of tar spot, please submit samples to the K-State Plant Pathology Diagnostic Clinic at https://www.plantpath.k-state.edu/extension/plant-disease-diagnostic-lab/

Factors that influence corn yield response to fungicide applications

Research clearly demonstrates that the single best time to apply a fungicide to corn for gray leaf spot control is from VT to R1. First applications for tar spot disease management should be between V10 to VT growth stages, and, if needed, a second fungicide application should be between R1 to R3 growth stages. A single application at V6 – V8 will not hold up against late-season pressure. A VT to R3 growth stage fungicide application may also provide suppression of southern rust. Some fungicides that are good to excellent for gray leaf spot are also very good for tar spot and southern rust control. Summaries of multi-year university research about fungicide efficacy can be found here:

https://cropprotectionnetwork.s3.amazonaws.com/CPN2011_FungicideEfficacyControlCornDiseases_04_2022-1650470887.pdf

Disease risk factors to consider when weighing the benefits of a fungicide application

Susceptibility level of corn hybrid. Seed companies typically provide information on the susceptibility of their hybrids to tar spot, gray leaf spot, and southern rust. In general, hybrids that are more susceptible to fungal foliar diseases will have a greater response to a foliar fungicide (if disease pressure is high enough).

Previous crop. Because tar spot and gray leaf spot survive in corn residue, the risk of disease increases when corn is planted back into a field that was in corn the previous year. Fields with a history of gray leaf spot and tar spot should be closely scouted. Southern rust, on the other hand, blows in from the south each year. It is important to watch regional updates about southern rust pressure in the state.

Weather. Rainy and/or humid weather generally is most favorable to gray leaf spot. In growing seasons, when these conditions prevail, the risk for disease development increases. Southern rust is favored by warm days and nights (> 80 degrees) and high humidity. Tar spot is favored by mild temperatures (60F to 73F), high relative humidity (>75%), and a prolonged leaf wetness period (>7h).

Field history. Some field locations may have a history of high foliar disease severity. Fields in river bottoms or low areas or surrounded by trees may be more prone to having gray leaf spot.

If no disease is present or pressure is low, I recommend holding off on the VT-R1 application since efficacy will begin to wane in three to four weeks, just as late-season pressure may begin to develop. Data suggests that if disease pressure begins to develop later, an R2 application can be economical and will provide protection later into the grain fill period. This later application could also protect against any late-season southern rust pressure.

Distinguishing between gray leaf spot and bacterial streak

Bacterial streak, identified as a new corn disease in the U.S. in 2016, is now active in most of western Kansas. While yield loss potential for this disease remains unknown, we do know that it can be misidentified as gray leaf spot, resulting in unwarranted fungicide applications. Fungicides will not have any effect on bacterial streak. Remember that gray leaf spot typically has very sharp edges defined by the leaf veins, whereas bacterial streak will have a wavy edge that can cross the leaf vein (Figure 4). Also, when backlit with light, gray leaf spot lesions will have an opaque appearance, while bacterial streak lesions are more translucent (Figure 4).

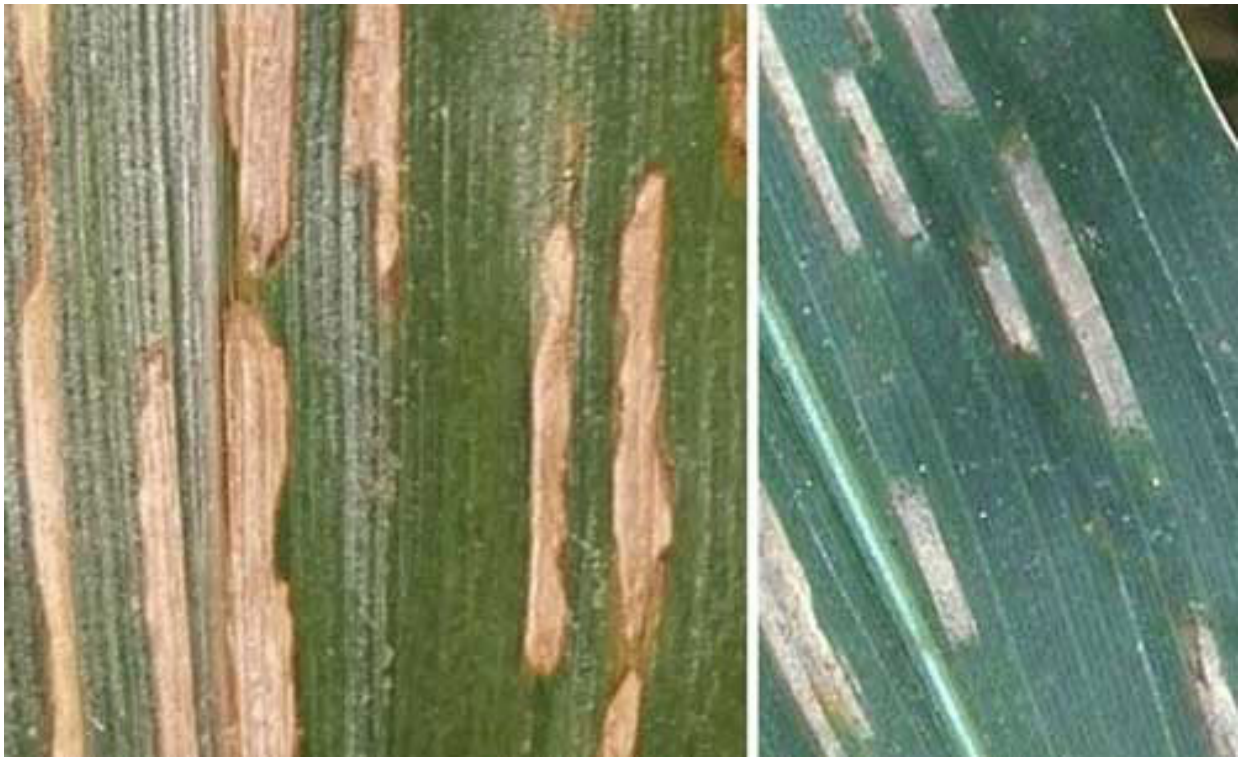

Figure 4. Comparison of sharp-edged gray leaf spot lesions (right) with wavy-edged bacterial streak lesions (left). Photo courtesy of the University of Nebraska.

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7. World of Weeds - Tumblegrass

Tumblegrass (*Schedonnardus paniculatus*) is a native perennial grass that can become problematic in no-till fields. Don't confuse tumblegrass with tumble windmillgrass – another troublesome native perennial grass discussed in a previous World of Weeds article.

Ecology

Tumblegrass (Figure 1) is found throughout Kansas. It can grow in various sites but prefers dry areas with clay or clay loam soils. It is considered an indicator of disturbed soils and is associated with high sodium in the soil. Although it is a perennial, tumblegrass reproduces mainly by seed. Seed heads readily break away at the base like tumble windmillgrass, which facilitates seed dispersal by wind. It is not used by livestock or wildlife.

Figure 1. Tumblegrass growing in a no-till fallow field in Finney County. Note the height of the seed heads in comparison to the height of the leaves. Photo by Logan Simon, K-State Research and Extension.

Identification

Tumblegrass leaves are primarily located near the base of the plant, forming a clump. They are one to six inches long and folded. They are hairless but have a prominent midvein and white margin and may have fine teeth on the margins. Leaf blades become spirally twisted when the plant is mature. The leaf sheaths, loose and crowded at the base, are keeled (folded) with no hairs but have membranous margins. The ligule is also membranous and is continuous with the sheath margin. (Figure 2) This feature distinguishes it from tumble windmillgrass, which has a hairy ligule.

Figure 2. Tumblegrass ligule is membranous and connected to the margins of the leaf sheath. Photo by Mike Haddock, kswildflower.org.

The arched culm (stem) gets longer between flowering and seed maturity. Seed heads are loosely spiraled panicles two to 24 inches long (more than half the height of the plant). Panicles comprise three to 13 wide-spaced, spike-like branches that are slightly curved when mature (Figure 3).

Figure 3. Widely-spaced, slightly curved, spike-like branches of tumblegrass. Photo by Mike Haddock, kswildflower.org.

Management

Little information is available on controlling tumblegrass. It can be inferred from some research that tumblegrass will tolerate applications of glyphosate and chlorsulfuron (Glean). Grazing has limited effectiveness as a management tactic due to being unpalatable. Fire is also not likely to be effective because, being native to the Plains, tumblegrass is a fire adapted species.

An upcoming article will address the best management options for warm-season perennial grasses. Stay tuned!

The use of trade names is for clarity to readers and does not imply endorsement of a particular product, nor does exclusion imply non-approval. Always consult the herbicide label for the most current use requirements. Users should read and follow all label instructions.

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8. 2024 Kansas Corn Yield Contest: Early registration deadline is June 30

Celebrating a remarkable milestone, Kansas Corn joins the National Corn Growers Association (NCGA) in announcing the launch of the 60th annual National Corn Yield Contest. This iconic event has been a testament to the ingenuity and dedication of corn growers nationwide. The Kansas Corn Yield Contest partners with the national contest to recognize and award Kansas growers. The Kansas Corn Yield Contest is sponsored by Kansas Corn and K-State Research and Extension. The Kansas Corn Yield Contest allows Kansas farmers to compete for cash prizes and recognition and see how their yields stack up against other growers in their area.

Eligibility

All corn farmers are eligible to enter the contest but must be members of KCGA/NCGA. Your KCGA membership also includes membership in the NCGA. Join or renew your KCGA membership here: https://kscorn.com/join/. Kansas growers who enter the NCYC are automatically entered in the Kansas Corn Yield Contest. The Kansas Corn Yield Contest is linked to the national contest, allowing growers to submit one registration and one harvest form for both the national and state contests.

Among the highlights of the national competition is Class J, the Nitrogen Management Class, which enters its second year, showcasing opportunities to think differently about fertilizer management while still achieving high yields. Last year, Kansas farmer, Francis Kelsey from Shawnee County placed 15th in the national pilot program for this special class. This year, the Corn Yield Contest Nitrogen Management pilot class will be open to the first 100 entries from several states, including Kansas. The three highest-yielding entries in the class will be declared preliminary winners and confirmed as class winners after an NCGA verification of actual nitrogen applied.

Registration Entry and Deadline Information

- Registration is now open at https://ncga.com/get-involved/national-corn-yield-contest
- **Early entry: May 1 – June 30**. $75 per online entry plus a one-time affiliated state/NCGA membership fee (if applicable)
- Final entry: July 1 – August 14. $110 per online entry plus a one-time affiliated state/NCGA membership fee (if applicable
- Harvest entry: August 15 – November 30
- NCGA National Corn Yield Contest Winners will be announced on December 11, 2024
- Kansas Corn Yield Contest Winners will be announced on December 27, 2024

Many seed companies pay for entry and membership fees for growers through the NCYC voucher program.

In the Kansas Corn Yield Contest, growers compete for cash prizes and recognition for irrigated and

non-irrigated yields in ten districts as well as awards for the state's top irrigated and non-irrigated entries. Kansas CYC prizes will be awarded at the Kansas Corn Symposium in January 2025. In the National Corn Yield Contest, winners will receive national recognition in publications and other awards from participating sponsoring seed, chemical, and crop protection companies. NCYC winners will be honored at the 2025 Commodity Classic in Denver.

For more information, contact Kylie Massengale at 785-249-8723 or kmassengale@ksgrains.com.

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9. Save the date - Sorghum Connection: Maximizing Sorghum Yield

Save the dates for a new series of sorghum programs titled "**Sorghum Connection**," consisting of field schools and winter meetings across Kansas. Sorghum connection is a collaborative effort between the K-State Department of Plant Pathology, K-State Research and Extension, and the Kansas Grain Sorghum Commission. These events aim to bring multi-disciplinary, data-driven information to our Kansas Grain Sorghum producers to help improve on-farm productivity and profitability! Topics will include fertility, breeding, weed management, disease management, marketing, insect management, and more. You don't want to miss out on this series of events!

Large Field Schools	**Winter Schools**
City: Bavaria, KS Coordinates: 38°47'50.6"N 97°46'44.2"W Field day: September 4	**City: Salina** Date: December 4, 2024
City: Dighton, KS Coordinates: 38°29'44.2"N 100°28'26.2"W Field day: September 11	**City: Hays** Date: December 5, 2024
City: Russel, KS	**City: Garden City**

Coordinates: 38°53'36.2"N 98°50'44.9"W Field day: September 18	Date: December 6, 2024

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