Issue 975

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eUpdate

09/21/2023

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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eUpdate Table of Contents | 09/21/2023 | Issue 975

1. Tar Spot of corn is confirmed in double the counties in Kansas from last season

Tar spot of corn, a disease caused by the fungus *Phyllachora maydis*, has now been confirmed in Doniphan (6/26), Atchison (6/30), Jefferson (6/30), Brown (7/05), Nemaha (7/28), Jackson (8/8), Marshal (8/22), Leavenworth (8/28), Pottawatomie (9/8), Wabaunsee (9/8), Washington (9/21), and Douglas (9/21) counties (Figure 1). Tar Spot is active in all counties previously reported during the 2022 season, first detected late in the season (9/15/2022). Tar spot prevalence and severity are much higher than in the 2022 season, which has led to severe yield impacts in some locations.

Before harvest is a critical time to identify fields with tar spot as these locations may be at higher risk for the disease next year. Producers should also consider harvesting fields confirmed to have tar spot last to mitigate additional disease spread. Because of this, scouting before harvest is critical.

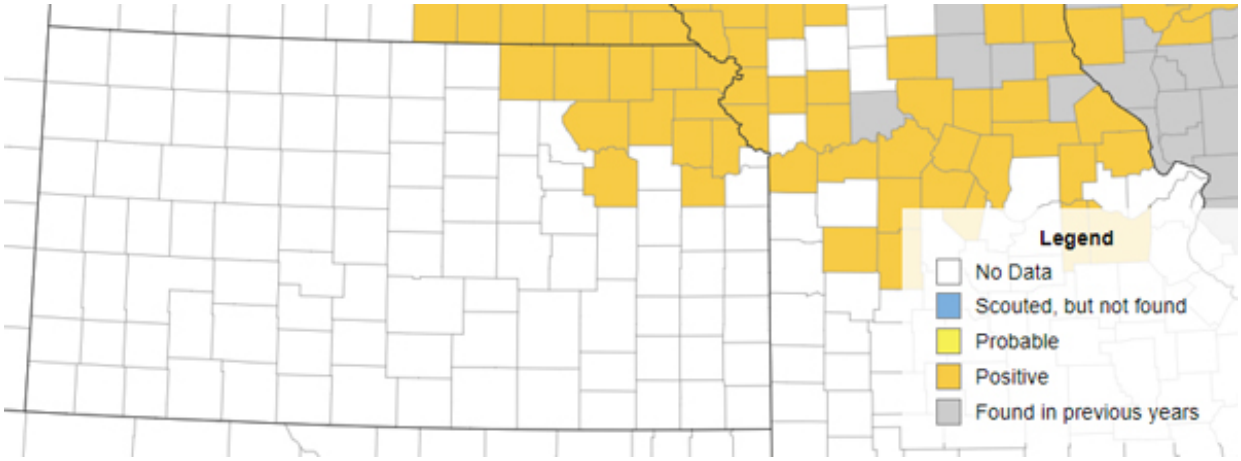

Figure 1. Tar Spot of Corn (Phyllachora maydis**) in Kansas and surrounding states in 2023.**
Source: https://corn.ipmpipe.org/tarspot/

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 leaf's surface **(**Figure 2**)**. For assistance in confirming tar spot, please get in touch with your local county extension office or the K-State plant diagnostic clinic at https://www.plantpath.k-state.edu/extension/plant-disease-diagnostic-lab/.

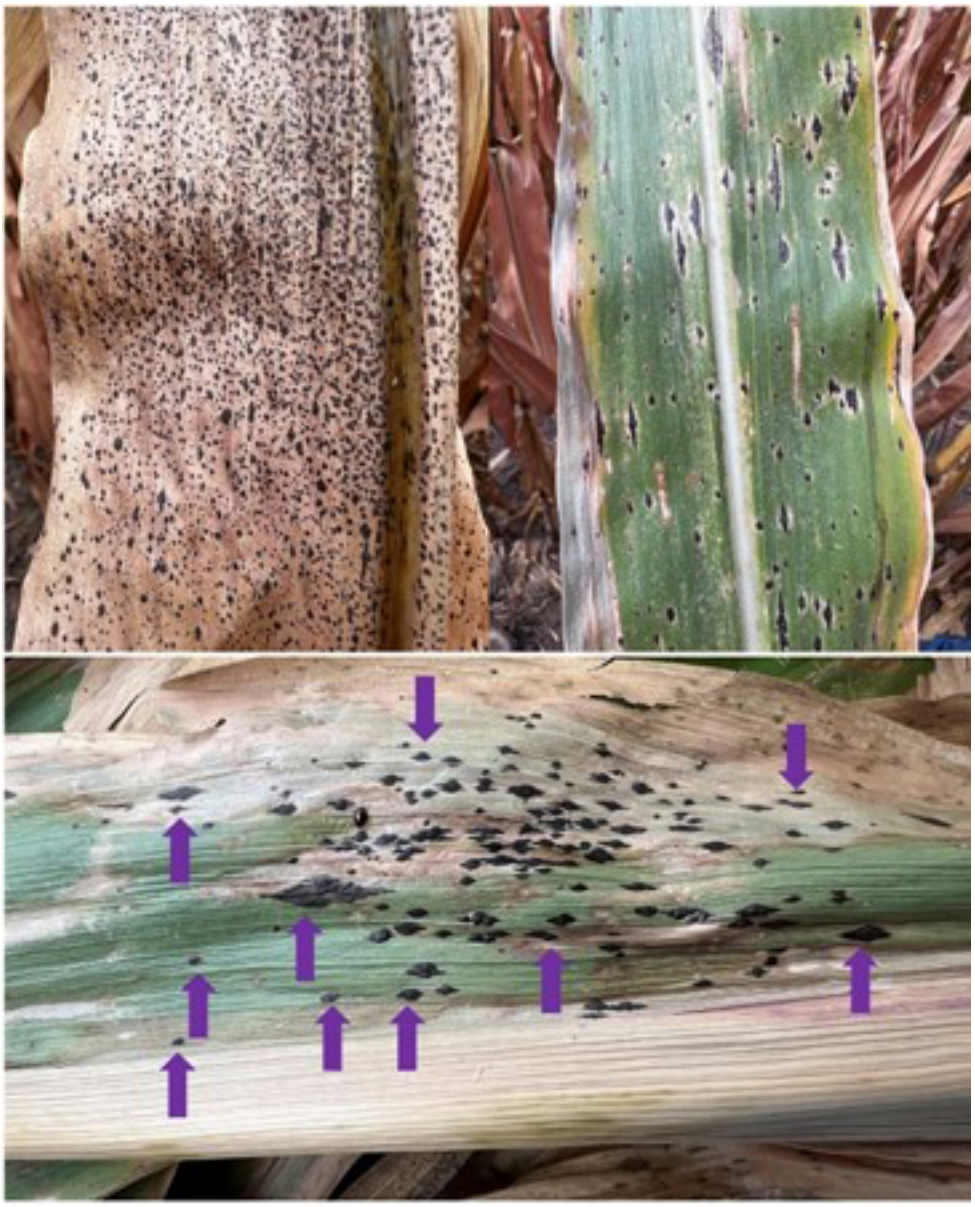

Figure 2. Tar Spot of Corn. Purple arrows indicate a few of the tar spot lesions. Photos courtesy of Rodrigo Onofre, Department of Plant Pathology, K-State Research and Extension.

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

Tar spot overwinters on 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 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, then 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 it is needed, and we recommend holding off until the disease is active in your field and corn is at least nearing VT/R1 (tassel/silk) or even R2 (blister). Scouting will be especially important if wet weather continues. Several fungicides are highly effective at controlling tar spot when applied from tassel (VT) to R2 (blister). 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 can be found at the Crop Protection Network website, link: 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 prior to application.

Help track tar spot in Kansas

Please help us track tar spot. You can contact me (785-477-0171) directly if you suspect a field has tar spot 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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2. Wheat planting - Tips for good stand establishment

Regardless of the soil moisture conditions at wheat planting time, there are a few important steps producers can take to improve their chances of getting a good stand of wheat.

Proper tractor speed. It is best to use a tractor speed of between 5 and 6 miles per hour in most cases when drilling wheat, depending on the amount of down pressure on the openers. If higher speeds are used, the openers can tend to "ride up" in the soil now and then if down pressure is insufficient.

Proper, uniform seeding depth. The ideal planting depth for wheat, in most cases, is about 1.5 inches. When planting early into very warm soils, it is especially important not to plant too deeply since coleoptile lengths are shorter than normal under warm conditions. On the other extreme, producers should also be especially careful not to plant too deeply when planting later than the recommended time into very cool soils. Getting a uniform seeding depth is also important. Where producers plant into fields with heavy residue or uneven chaff distribution from the previous crop, uneven planting depth can be a serious problem. In those situations, it is common to end up with poor stand establishment in field areas where the drill opener rode up over the residue or chaff and could not penetrate the soil to the same depth as in other field areas.

Firm seedbed. Planting into loose, fluffy soils can be a problem where soils have been tilled repeatedly during the summer. When seeds are planted into loose soils, rains in the fall will settle the soil and leave the crowns of the seedlings too close to the soil surface. A good closing system behind the drill openers, with adequate down pressure, should help.

Plant during the optimum window. In general, wheat should be planted somewhere around the Hessian fly-free date. There may be good reasons to plant some wheat before the fly-free date, such as planting for pasture or time pressures from having considerable acreage to plant. But stand establishment and ultimate grain yields are usually best when wheat is planted after the best pest management planting date (BPMP, former Hessian fly-free date) and before deadlines set by crop insurance. Planting more than three weeks after the BPMP can be risky. Late-planted wheat often does not develop an adequate root system before winter and forms fewer productive fall tillers. When planting late, seeding rates should be increased by 25 to 50 percent to help ensure an adequate stand and compensate for the lack of tillering. See the accompanying article about the risks of planting wheat too early.

Adequate soil fertility. In general, producers should apply at least part of their nitrogen before or at planting time to get the plants off to a strong start. Nitrogen rates of 20-30 lbs can help with fall establishment and tillering. If the soil is low or very low in phosphorus or potassium, these nutrients should be applied at planting time as well so that the plants benefit early in their development. Starter phosphorus with the seed or band-applied close to the seed can also help with fall early growth and establishment, particularly in low-testing soils. Low soil pH can be a concern, particularly early in the season when root systems are mostly near the surface, which is often an area of lower pH. Soil tests will determine the need for pH adjustment and the potential for aluminum toxicity. Variety selection and phosphorus application with the seed are potential management strategies for low pH and aluminum toxicity issues if it is too late to apply lime before seeding.

Make adjustments for planting into row crop stubble. When planting wheat into grain sorghum stubble, producers will need an extra 30 lbs N per acre over their normal N rate. Also, it is important

to ensure the sorghum is dead before planting wheat. When planting wheat into soybean stubble, producers should not reduce their N rates since the N credit from soybeans doesn't take effect until the following spring. If the wheat is planted no-till after row crop harvest, N rates should be increased by 20 lbs N per acre over the normal N rate. Seeding rates should be increased when planting wheat late after row crop harvest. It's best to use a seeding rate of 90 to 120 lbs per acre in central and eastern Kansas and 75 to 100 lbs per acre in western Kansas. When planting more than three weeks after the BPMP date, producers should use a seeding rate of 120 lbs per acre.

Watch out for potential disease issues when planting into corn residue. The risk of some diseases may be higher when wheat is planted in fields with large amounts of corn residue left on the soil surface. Fusarium head blight (scab) of wheat, for example, is caused by a fungus known to cause stalk rot in corn (information about stalk rots in corn is discussed in an article in this eUpdate issue).

Using a seed treatment. Seed treatments can sometimes act as insurance, helping avoid seed-born and early-season fungal diseases. Check out a previous eUpdate article on seed treatments for wheat disease management at https://bit.ly/487HZHu

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3. Check for stalk rots before grain sorghum harvest

It is important to check sorghum and corn fields for stalk rot diseases before harvest. The two most common types of stalk rot in grain sorghum and corn are charcoal rot and Fusarium stalk rot. Both diseases survive in crop residue and can survive in the soil for many years. Stalk rots have somewhat similar symptoms, so it is useful to be able to tell them apart. Even in fields where lodging has not yet occurred, producers should be prepared to deal with stalk rot issues. This article focuses on stalk rots in sorghum, and a companion article in this eUpdate discusses stalk rots in corn.

Figure 1. Sorghum lodging caused by Fusarium stalk rot. Photo by Kim Larson, Agronomist.

Annual losses are difficult to determine because, unless lodging occurs, the disease mostly goes unnoticed. The best estimates are that at least 5% of the sorghum crop is lost each year to stalk rot. The incidence of stalk rot in individual fields may reach 90 to 100% with yield losses of 50%. The most obvious losses occur when plants lodge. More important may be the yield losses that go unnoticed. In sorghum, yield losses are caused by reduced head size, poor filling of grain, and early head lodging as plants mature early.

Symptoms generally appear several weeks after pollination when the plant appears to ripen prematurely. The leaves become dry, forming a grayish-green appearance similar to frost injury. The stalk usually dies a few weeks later. Diseased stalks can be easily crushed when squeezed between the thumb and finger and are more susceptible to lodging during wind or rainstorms. The most characteristic symptom of stalk rot is the shredding of the internal tissue in the lowest internodes of the stalk, which can be observed when the stalk is split. This shredded tissue may be tan-colored (Fusarium stalk rots), red or salmon (Fusarium and Gibberella stalk rots), or grayish-black (charcoal rot).

Table 1. Summary of stalk rots in grain sorghum.

Disease	Symptoms	Weather
Charcoal rot stalk rot	Internal shredding of lower nodes; black microsclerotia attached to the vascular tissue	High soil temperatures (>90 °F) and low soil moisture during grain fill
Fusarium stalk rot	Internal shredding of lower nodes; tan or pink-to-purple internal discoloration	Dry conditions early and warm (82-86 °F) wet weather 2 to 3 weeks after pollination

Charcoal rot

Hot, dry weather with soil temperatures in the range of 90 °F or more is ideal for the development of charcoal rot. Drought does not cause the problem, but it weakens the plants' defenses. Charcoal rot is usually less severe if drought stress is not a factor.

While it is difficult to separate the effects of charcoal rot from simple drought stress, a good rule of thumb is that plants infected with charcoal rot will die about two weeks earlier from dry weather than plants that do not have charcoal rot. Grain fill that would have occurred during this period is the yield loss attributed to charcoal rot.

The plants will die prematurely. When stalks are split, the typical shredded appearance in the lower stalk associated with all stalk rots will be present. Additionally, there will be a gray to black discoloration of the inner stalk caused by numerous sclerotia (small, black survival structures of the fungus) forming on the vascular bundles and decaying tissue.

Figure 2. Close-up of charcoal rot in grain sorghum. Photo by Doug Jardine, K-State Research and Extension.

Fusarium stalk rot

Fusarium root and stalk rot are generally found in the same areas where charcoal rot develops. The pith of Fusarium stalk rot-infected plants will have a shredded appearance and is typically tan, but in some hybrids, the pith in the lower stalk may be pink to red. Plants may die prematurely or lodge.

Fusarium stalk rot is favored by wet conditions early in the season when denitrification or nitrogen loss from leaching. Research has shown that mid-season dry weather may predispose plants to later-season problems. Later in the season, following pollination, warm (82 to 86 °F), wet weather can leach remaining nutrients from the soil, resulting in late-season nitrogen stress and an increase in stalk rot.

Figure 3. Fusarium stalk rot in grain sorghum. Source: Stalk Rots of Corn and Sorghum**, K-State publication L-741.**

The most recent drought monitor index map for Kansas provides clues as to where stalk rot problems may occur (Figure 4). In the areas of the state currently under drought stress, charcoal rot may be more common. In other parts of the state with alternating wet and dry periods throughout the growing season, Fusarium stalk rot may be more common.

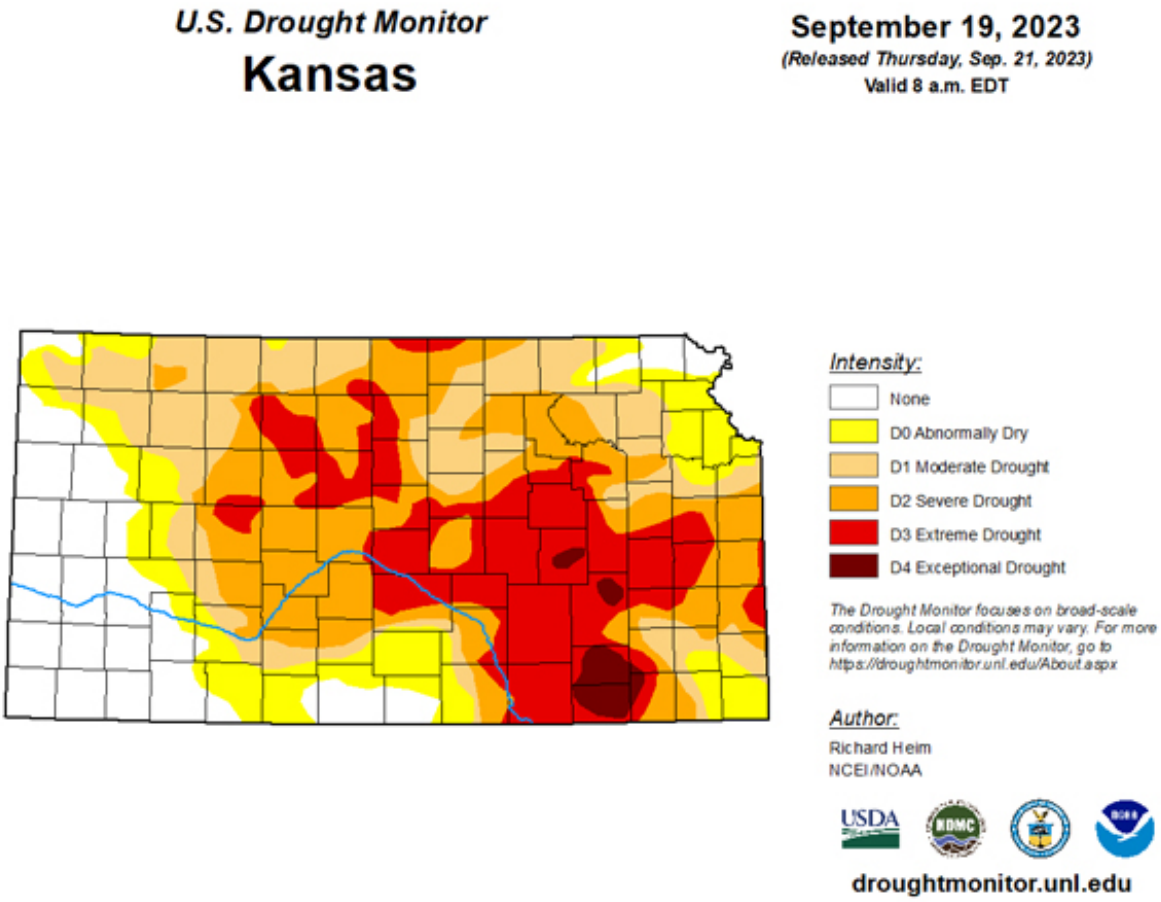

Figure 4. U.S. Drought Monitor Index map for Kansas as of September 19, 2023. https://droughtmonitor.unl.edu/

General considerations

Stalk rot is a stress-related disease. Any stress on a crop can increase both the incidence and severity of stalk rot. Research has indicated that when the carbohydrates used to fill the grain become unavailable due to nutrient shortage, drought stress, leaf damage from insects, hail, disease, or reduced sunlight, the plant uses nitrogen and carbohydrate reserves stored in the stalk to complete grain fill. When sugarcane aphid pressure is heavy, there will likely be an increase in the incidence of stalk rot, and producers should be prepared to harvest as soon as the grain is ready.

The loss of nitrogen and carbohydrate reserves resulting from leaf damage weakens stalk tissues and results in increased stalk rot susceptibility. Early maturing hybrids are generally more susceptible than full-season hybrids.

Besides irrigation or rain, little can be done to prevent stalk rot by late summer. No hybrid has complete immunity to the stalk rotting pathogens. When choosing a hybrid, a grower should select a hybrid that is not only a high yielder but has good standability and “stay-green” characteristics. This will help ensure that if stalk rot does occur, losses due to lodging will be minimal. A balanced nutrition program based on soil tests should be used. Overall fertility levels should be adjusted to fit the hybrid, plant population, soil type, environmental conditions, and management program. An

excess, as well as a shortage of nitrogen, can lead to increased stalk rot problems.

Producers can check their sorghum for stalk rots by squeezing the lower stem with their thumb and fingers. If the stalks crush easily, they are probably infected with one of the stalk rot organisms and may lodge at any time. Check 100 plants across the field to determine the percentage of affected plants. If the percentage of stalk-rot-infected plants is high, sorghum should be harvested as soon as possible, even if it hasn't dried down adequately in the field. If the stalks are firm, the plants will probably be able to stand just fine in the field for several more weeks if necessary.

Rotation with non-susceptible crops, such as small grains and alfalfa, will reduce the severity of stalk rot but will not eliminate it. A good insect control program is a must in limiting losses to stalk rot. In addition to the effect of leaf damage on stalk integrity, pathogens may enter stalks or roots through wounds created by insects. Hail damage will generally increase the amount of stalk rot damage.

For more information, see "Stalk Rots of Corn and Sorghum," K-State publication L-741, at:
http://www.plantpath.k-state.edu/extension/publications/L741.pdf

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4. Common causes of late-season stalk lodging in corn

Stalk lodging in corn occurs when the stalk weakens and breaks at some point below the ear (Figure 1). When this occurs, it results in harvest losses and slows down harvesting considerably. Grain moisture levels may also be unacceptably high in lodged corn.

Figure 1. Stalk rot in corn at Kansas River Valley Experiment Field, 2016. Photo by Eric Adee, K-State Research and Extension.

Two common causes of stalk lodging are stalk rot diseases and corn borer damage. Stalk rotting diseases in Kansas include charcoal rot, Fusarium, Gibberella, anthracnose, and Diplodia. Stalk rotting diseases are present in the soil or on old crop debris every year, but disease only develops when certain other factors predispose the plants to disease infection.

What are the common causes of stalk lodging in corn in Kansas?

Carbohydrate depletion in the stalk during grain fill. High-yielding, "racehorse" hybrids tend to produce superior yields at the expense of late-season stalk integrity. These hybrids translocate a high percentage of carbohydrates from the stalks to the ears during grain fill. The latter is reflected in a substantial reduction in the stalk diameter from flowering until maturity (stem shrinking process). This weakens the lower stalk until it eventually breaks over, possibly after becoming infected with a stalk rot disease. However, this does not mean producers should stay away from these hybrids. These hybrids have to be managed well. They should be harvested early, shortly after physiological maturity. This may mean harvesting the corn at about 20-25 percent grain moisture. Early harvest can result in discounts for high moisture, but it is better than leaving those hybrids in the field so long

that stalks break.

Hybrid differences in stalk strength or stalk rot susceptibility. Some hybrids have genetically stronger stalks than others do. This is often related to a hybrid's yield potential, as mentioned above, and how it allocates carbohydrates during grain fill. However, there are genetic differences in stalk strength for other reasons, including better resistance to stalk rot diseases. If a field of corn has stalk lodging problems, it could be partly due to hybrid selection.

Poor root growth and other stresses. Cold, waterlogged soils, severe drought (a critical factor for this season), and soil compaction can all result in short, inadequate root systems and crowns that are damaged to the point that water and nutrients cannot effectively move through them. Under these conditions, the roots may not extract enough water and nutrients from the soil to support plant growth and carbohydrate production. When carbohydrate production is below normal during any part of the growing season, the ears will continue to take what they need during grain fill, which can leave the stalks depleted even under average yield conditions. The developing ear always has priority for carbohydrates within the plant.

Tar spot of corn. Tar spot is an emerging disease in Kansas that can affect stalk rot (Figure 2). Any factor that results in poor leaf health will reduce carbohydrate production. When carbohydrate production from photosynthesis is inadequate due to loss of green leaf area in the leaves, the plant will mobilize reserves from the crown and lower stalk to complete grain fill (see carbohydrate depletion above).

Figure 2. Premature leaf death caused by severe levels of tar spot on corn. Photo courtesy of Rodrigo Onofre. K-State Research and Extension.

Many hybrids lack good resistance to tar spot, and producers should be ready to apply a fungicide when the disease is active and in the corn canopy. More information tar spot, including the best time to apply fungicide, can be found in a companion article in this issue of the Agronomy eUpdate.

High plant density. Plants become tall and thin when supra-optimal populations are used, which results in thin stalks with inadequate strength (Figure 3). In addition, plant-to-plant competition for light, nutrients, and water enhances the competition for carbohydrates between the stalk and ear within the plant, thus reducing the vigor of the cells in the stalk and predisposing them to invasion by stalk rot.

Nutrient imbalances and/or deficiencies. Nutrient imbalances and/or deficiencies predispose corn plants to stalk rot and stalk lodging. Both potassium and chloride deficiency have been shown to reduce stalk quality and strength and stalk rot resistance. High nitrogen levels coupled with low potassium levels increase the amount of premature stalk death and create an ideal situation for stalk rot and lodging. Soil chloride levels should be maintained above 20 lbs per acre.

Figure 3. High plant density corn presenting late-season stalk lodging. Photo by Ignacio Ciampitti, K-State Research and Extension.

Corn rootworm and corn borers. Damage caused by the corn rootworm and the European corn borer can predispose the corn plant to invasion by stalk rotting organisms, as well as lead to outright yield loss.

Mid-season hail damage. Similar to the damage caused by insects, the physical damage caused by mid-season hail can set up the plant for invasion by stalk rotting organisms. Stalk bruising and the resulting internal damage may also physically weaken corn stalks, making them more likely to lodge later in the season.

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5. World of Weeds - Asiatic Dayflower and Erect Dayflower

Dayflower species are unique in that they look like broadleaf plants, but they are a monocot in the spiderwort family– more closely related to grasses. Carl Linnaeus assigned the genus name as a tribute to the Dutch family, the Commelins, which included two notable botanists and a third botanist who was less prominent. These plants stand out in late summer with their flowers comprised of two pale blue/purple petals and a third, less prominent petal.

Ecology

As the name implies, Asiatic dayflower (*Commelina communis*) is native to Asia, but it is now adapted throughout the eastern United States, including eastern Kansas. Erect dayflower (*C. erecta*) is native to North America and found throughout Kansas. Dayflowers are generally found in shady areas with moist soils. Asiatic dayflower prefers soils with high fertility, while erect dayflower is typically more likely to be found in sandy soils. One important distinction between the two species is that the Asiatic dayflower is an annual, and the erect dayflower is a perennial. Deer and cattle may consume dayflower species, and quail and doves may consume seeds.

Identification

Dayflower species have succulent stems and leaves. Stems initially grow erect with many branches that become creeping (Asiatic) or decumbent – shaped like an upside-down umbrella (erect). Plants can grow up to 20 inches tall, and creeping stems can grow up to 30 inches long in dense mats. Stems are swollen at the notes, giving a jointed appearance. Both plants have fibrous roots and can root at the nodes.

The first leaves are oblong with a rounded point and are easily confused with a grass. The leaves of both plants are alternately arranged and directly attached to the stems (sessile). They are 0.6 to 4 inches long by ½ to 1.5 inches wide with parallel veins and entire margins. The upper surface can be hairless or have hairs. Both species have an inconspicuous sheath at the base of the leaves fringed with whitish hairs (Figure 1).

Figure 1. Mat of Asiatic dayflower growing at the margins of a cornfield in a creek bottom in Geary County. Note the hairy sheath above the swollen node on the stem. Photo by Sarah Lancaster, K-State Research and Extension.

Flowers of both species occur in small clusters at leaf axils (Figure 2). Each flower has three parts – two showy, blue-violet petals and one smaller, white petal. Flowers are enclosed by a leaf-like bract called a spathe. As the name *day*flower implies, each flower only blooms for one day, although a plant will bloom for an extended time.

Fruits are capsules with two or three parts. Seeds are small (< 5 mm long) and brown. Asiatic dayflower seeds are pitted on one side and smooth on the other. Seeds can germinate throughout the season and remain viable in the soil for up to five years.

Figure 2. Dayflower flowers. Note the inconspicuous white petal in the Asiatic dayflower photo on the right and the hairy, fused spathe surrounding the erect dayflower flower in the photo on the right. Photos by Sarah Lancaster, K-State Research and Extension.

Management

Asiatic dayflower doesn't tolerate disturbance, so it is generally easily controlled in conventionally tilled fields. In no-tillage situations, it can be controlled with herbicides that contain flumioxazin (Valor, others). It is not well-controlled by glyphosate.

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.

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6. Kansas Bankers Association Conservation Awards Program - Nominations due Nov. 10

Nominate a deserving Kansas producer or landowner for the 2023 Kansas Bankers Association Conservation Awards Program. This year, the Kansas Bankers Association, K-State Research and Extension, and the Kansas Department of Wildlife and Parks have announced six award categories:

- **Energy Conservation**
- **Water Quality**
- **Water Conservation**
- **Soil Conservation**
- **Windbreaks**
- **Wildlife Habitat**

The purpose of this program is to stimulate a greater interest in the conservation of the agricultural and natural resources of Kansas by giving recognition to those farmers and landowners who have made outstanding progress in practicing conservation on their farms. In 2021, over 200 Kansas producers and landowners were recognized through this program.

Submit this form to the County Extension Office or District Biologist for Kansas Wildlife, Parks, and Tourism (Wildlife Award only) no later than **November 10, 2023**.

A committee of conservation professionals will submit the names of the selected recipients to the KSU Agronomy Extension office (or KDWPT for Wildlife Award) by December 8, 2023.

For more information, see: https://www.agronomy.k-state.edu/extension/kansas-bankers-award/

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7. Looking ahead - The first frost and freeze dates for Kansas

Meteorological fall began on September 1. It was warm early in the month, with highs over 100 degrees in many locations during Labor Day weekend. It has since turned more seasonable, with pleasant daytime temperatures, cool mornings, and, so far, no threat of cold air. Nowhere in Kansas has there been any frost yet, but it was 39°F in Tribune and 40°F in Colby on the morning of the 12th, a harbinger of colder weather yet to come. The autumnal equinox, which marks the beginning of astronomical fall, is this weekend, specifically on Saturday, September 23, at 1:50 AM central time. We will eventually experience a first frost and, in time, a first freeze, which can end the growing season, depending on how far below freezing the temperature gets and how many hours sub-freezing conditions persist. Exactly when do the first frost and freeze typically occur in Kansas? In this report, we look at the average dates for those two significant cold weather events.

Data for 20 sites in Kansas were examined using the full period of record at each location. For this study, the first frost date is defined as the first occurrence of a temperature at or below 36°, and the first freeze is defined as the first occurrence of 32°F or colder. The dates that the first frost occurred each year were sorted from earliest to latest, and then the dates on which 10%, 20%, 30%, etc., of the first frost occurred on or before were identified (Table 1). This methodology was repeated for the first freeze data (Table 2).

Table 1. Probabilities of the first fall frost occurring before the given dates.

First Frost	10%	20%	30%	40%	50%	60%	70%	80%	90%
Chanute	29-Sep	3-Oct	6-Oct	9-Oct	12-Oct	15-Oct	20-Oct	25-Oct	29-Oct
Concordia	21-Sep	28-Sep	1-Oct	5-Oct	8-Oct	11-Oct	13-Oct	18-Oct	24-Oct
Dodge City	25-Sep	29-Sep	5-Oct	8-Oct	10-Oct	11-Oct	15-Oct	19-Oct	23-Oct
Emporia	28-Sep	1-Oct	6-Oct	8-Oct	10-Oct	13-Oct	16-Oct	19-Oct	25-Oct
Fort Scott	27-Sep	1-Oct	6-Oct	9-Oct	12-Oct	17-Oct	20-Oct	25-Oct	30-Oct
Garden City	20-Sep	25-Sep	27-Sep	30-Sep	5-Oct	8-Oct	10-Oct	13-Oct	18-Oct
Goodland	13-Sep	17-Sep	21-Sep	26-Sep	28-Sep	30-Sep	4-Oct	6-Oct	9-Oct
Hill City	16-Sep	20-Sep	23-Sep	27-Sep	29-Sep	5-Oct	7-Oct	10-Oct	15-Oct
Horton	21-Sep	25-Sep	28-Sep	30-Sep	6-Oct	8-Oct	10-Oct	16-Oct	20-Oct
Manhattan	21-Sep	25-Sep	29-Sep	1-Oct	5-Oct	8-Oct	10-Oct	12-Oct	17-Oct
Marysville	18-Sep	22-Sep	27-Sep	29-Sep	2-Oct	4-Oct	7-Oct	10-Oct	14-Oct
Oberlin	15-Sep	19-Sep	20-Sep	22-Sep	26-Sep	27-Sep	30-Sep	5-Oct	9-Oct
Olathe	26-Sep	1-Oct	5-Oct	8-Oct	10-Oct	13-Oct	17-Oct	20-Oct	26-Oct
Pratt	21-Sep	28-Sep	4-Oct	7-Oct	10-Oct	13-Oct	19-Oct	23-Oct	26-Oct
Russell	22-Sep	26-Sep	1-Oct	3-Oct	6-Oct	10-Oct	11-Oct	15-Oct	21-Oct
Salina	24-Sep	30-Sep	4-Oct	6-Oct	10-Oct	12-Oct	15-Oct	19-Oct	25-Oct
Sedan	27-Sep	30-Sep	5-Oct	8-Oct	12-Oct	16-Oct	19-Oct	23-Oct	26-Oct
Topeka	24-Sep	29-Sep	4-Oct	7-Oct	9-Oct	12-Oct	16-Oct	22-Oct	26-Oct
Tribune	14-Sep	17-Sep	21-Sep	24-Sep	27-Sep	30-Sep	3-Oct	7-Oct	13-Oct
Wichita	1-Oct	7-Oct	10-Oct	13-Oct	18-Oct	22-Oct	24-Oct	27-Oct	3-Nov

Looking at the first frost date, the median date is in October, except for the far west and northwest areas of Kansas, where it occurs in late September. The median date is when there is a 50% chance of the first frost having already occurred. The earliest median date is in Oberlin (September 26), and the latest is in Wichita (October 18). Except for Wichita, there is a 10% probability of the first frost occurring before the first of October at all locations and a 90% probability that the first frost has occurred by the end of October.

Table 2. Probabilities of the first fall freeze occurring before the given dates.

First Freeze	10%	20%	30%	40%	50%	60%	70%	80%	90%
Chanute	10-Oct	16-Oct	19-Oct	22-Oct	25-Oct	27-Oct	29-Oct	3-Nov	6-Nov
Concordia	6-Oct	10-Oct	12-Oct	16-Oct	19-Oct	22-Oct	25-Oct	27-Oct	30-Oct
Dodge City	6-Oct	11-Oct	15-Oct	19-Oct	21-Oct	23-Oct	25-Oct	28-Oct	2-Nov
Emporia	7-Oct	10-Oct	15-Oct	18-Oct	22-Oct	25-Oct	28-Oct	31-Oct	5-Nov
Fort Scott	9-Oct	16-Oct	19-Oct	22-Oct	24-Oct	27-Oct	28-Oct	2-Nov	6-Nov
Garden City	28-Sep	4-Oct	8-Oct	10-Oct	14-Oct	17-Oct	19-Oct	23-Oct	27-Oct
Goodland	22-Sep	26-Sep	30-Sep	4-Oct	8-Oct	11-Oct	13-Oct	18-Oct	22-Oct
Hill City	26-Sep	1-Oct	5-Oct	9-Oct	11-Oct	13-Oct	16-Oct	21-Oct	24-Oct
Horton	29-Sep	5-Oct	7-Oct	10-Oct	12-Oct	17-Oct	22-Oct	25-Oct	29-Oct
Manhattan	1-Oct	7-Oct	10-Oct	12-Oct	15-Oct	19-Oct	21-Oct	25-Oct	29-Oct
Marysville	23-Sep	1-Oct	5-Oct	7-Oct	9-Oct	12-Oct	15-Oct	18-Oct	23-Oct
Oberlin	20-Sep	24-Sep	27-Sep	29-Sep	3-Oct	6-Oct	9-Oct	12-Oct	16-Oct
Olathe	8-Oct	12-Oct	17-Oct	22-Oct	25-Oct	27-Oct	31-Oct	4-Nov	7-Nov
Pratt	6-Oct	10-Oct	14-Oct	19-Oct	22-Oct	24-Oct	27-Oct	31-Oct	5-Nov
Russell	3-Oct	6-Oct	10-Oct	13-Oct	17-Oct	19-Oct	23-Oct	25-Oct	29-Oct
Salina	6-Oct	10-Oct	14-Oct	18-Oct	22-Oct	25-Oct	26-Oct	31-Oct	5-Nov
Sedan	6-Oct	12-Oct	18-Oct	20-Oct	24-Oct	27-Oct	29-Oct	4-Nov	8-Nov
Topeka	4-Oct	8-Oct	12-Oct	17-Oct	20-Oct	24-Oct	27-Oct	29-Oct	3-Nov
Tribune	21-Sep	25-Sep	28-Sep	4-Oct	7-Oct	10-Oct	11-Oct	14-Oct	20-Oct
Wichita	10-Oct	19-Oct	23-Oct	26-Oct	28-Oct	31-Oct	3-Nov	6-Nov	10-Nov

There is a 60% or greater chance that the first freeze will occur by the end of October at all locations (Table 2), but the probabilities are higher for earlier dates in the west and north. As with the first frost date, Oberlin has the earliest median date (October 3), and Wichita has the latest date (October 28). September freezes happen occasionally, and occasionally, it's November before the first freeze, but October is typically the month when the growing season ends. October is also when the normal lows each day decrease the fastest (Table 3); the daily normals drop by 11 to 14 degrees. By month's end, Goodland, Oberlin, and Tribune all have normal lows below freezing. Only eastern and southern locations have normal lows in the 40s by October 31; all other locations have normal lows in the 30s.

Last year, the first freeze was in mid-October across the entire state, thanks to a cold air mass that invaded the state and brought widespread lows in the 20s, with a few upper teens. The first freeze in 2022 was on the 16th in Goodland, the 17th in Garden City and Hutchinson, and the 18th in Wichita and Parsons. For the northwest, this freeze was later than normal, but in the southeast, it was earlier than normal. What about this year? It's too soon to know, but the outlooks for the next two weeks favor above-normal temperatures, so it doesn't appear that an early freeze will occur in September.

As for October, we'll have to wait and see. Until then, enjoy the pleasant fall weather!

Table 3. Normal low temperatures for selected dates across Kansas. Normals are based on the period 1991-2020.

Normal Lows	Sep 21	Sep 26	Oct 1	Oct 6	Oct 11	Oct 16	Oct 21	Oct 26	Oct 31
Chanute	57	55	53	51	49	47	45	43	42
Concordia	55	52	50	48	46	44	42	39	37
Dodge City	54	52	50	48	45	43	41	38	36
Emporia	55	53	51	49	47	45	43	41	39
Fort Scott	57	55	53	51	49	47	45	43	42
Garden City	52	50	48	45	43	40	38	36	34
Goodland	48	46	44	41	39	37	35	33	31
Hill City	52	50	47	45	42	40	38	35	33
Horton	54	51	49	47	44	42	40	38	36
Manhattan	55	53	51	49	46	44	42	40	38
Marysville	52	50	48	46	43	41	39	37	35
Oberlin	49	47	44	42	40	37	35	33	31
Olathe	57	55	52	51	49	47	45	43	41
Pratt	55	53	50	48	46	43	41	39	37
Russell	55	52	50	48	45	43	40	38	36
Salina	56	54	52	49	47	45	43	41	38
Sedan	56	54	52	50	48	46	44	42	40
Topeka	55	53	51	49	47	45	43	41	39
Tribune	49	46	44	41	39	36	34	33	31
Wichita	58	56	54	52	49	47	45	43	41

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