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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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eUpdate Table of Contents | 05/01/2025 | Issue 1051

1. Effect of standing water and saturated soils on corn growth

If corn has been planted, standing water or saturated soil conditions in areas of a field can produce impacts now or later for corn. Periods of early-season water saturation can cause immediate problems for small corn plants and can have season-long implications as well. Hopefully, the affected areas are small and confined to spots that are low-lying or poorly drained. While heavy rains and respective standing water have been limited to areas of northwest, northeast, and southeast Kansas, the coverage is expected to increase into mid-May. Precipitation is forecasted across most of the state with an emphasis on western Kansas, where upwards of 2-3 inches is possible. In addition to this above-normal moisture, temperatures will be cooler than normal with extensive periods of clouds. Thus, the extent of inundated corn may potentially increase as a result.

Factors affecting flood damage to corn include

- corn growth stage,
- the duration and frequency of saturated or standing water, and
- air and soil temperature while water is standing.

Saturated soil after corn emergence

After corn emerges, saturated soils inhibit root growth, leaf area expansion, and photosynthesis because of the lack of oxygen and cooler soil temperatures. Yellow leaves indicate a slowing of photosynthesis and plant growth. Leaves and sheaths may turn purple from the accumulation of sugars if photosynthesis continues but growth is slowed. Corn plants can recover with minimal impact on yield if the plants stay alive and conditions return to normal fairly quickly.

Figure 1. Young corn plants affected by water standing and soil erosion. Photo from K-State Research and Extension.

Although root growth can compensate to some extent later in the season, a saturated profile early in the season can confine the root system to the top several inches of soil, setting up problems later in the season if the root system remains shallow. Corn plants in this situation tend to be prone to late-season root rot if wetness continues throughout the summer, and stalk rots if the plants undergo mid- to late-season drought stress. Plants with shallow root systems also become more susceptible to standability problems during periods of high winds.

Tolerance of young corn plants to full submersion

Young corn plants can tolerate only a few days of full submersion. In some cases, symptoms and stand problems seen late in the season may trace back to flooding when the plants were young. Before V6, when the growing point is at or below the soil surface, corn can survive only 2-4 days of flooding. The chances of plant survival increase dramatically if the growing point was not completely submerged or if it was submerged for less than 48 hours. After 48 hours of soil saturation, soil oxygen is depleted, and critical plant functions (photosynthesis, water uptake, and nutrient uptake) are impaired.

Thus, young corn plants are more susceptible than corn beyond the V6 stage, when the plants are taller and the growing point is above the surface. Research has demonstrated yield reductions from early-season flooding ranging from 5% to 32%, depending on soil nitrogen status and duration of flooding.

Complicating factors

Temperatures can influence the extent of damage from flooding or saturated soils. Cool, cloudy weather limits damage from flooding because growth is slowed and because cool water contains more oxygen than warm water. Warm temperatures can increase the chances of long-term damage.

Silt deposition in the whorls of vegetative corn plants can inhibit the recovery of flooded corn plants. Enough soil can be deposited in the whorl that the emergence of later leaves is inhibited. A heavy layer of silt on leaf surfaces can potentially inhibit photosynthesis or damage the waxy surface layer of the leaf (cuticle), making the leaves subject to drying out. New leaves should not be affected if they can emerge normally. Ironically, what is often best for the silt-covered plants is to receive a small shower to help wash off the leaves.

In some instances, the soil in the whorl may contain certain soft-rotting bacteria. These bacteria can cause the top of the plant to rot. The whorl can easily be pulled out of a plant infected with these soft-rotting bacteria. In addition, a rather putrid odor will be present. These plants will not recover.

Disease considerations

Flooding can increase the incidence of moisture-loving diseases like crazy top downy mildew. Saturation for 24 to 48 hours allows the crazy top fungus spores found in the soil to germinate and infect flooded plants. The fungus grows systemically in the plant, often not causing visual symptoms for some time. Symptom expression depends on the timing of infection and the amount of fungal growth in the plant. Symptoms include excessive tillering, rolling and twisting of upper leaves, and proliferation of the tassel. Eventually, both the tassel and ear can resemble a disorganized mass of small leaves, hence the name "crazy top."

Figure 2. Crazy top in corn. Photo by Rodrigo Onofre, K-State Research and Extension.

Other concerns: Denitrification, cold weather crown stress, green snap, and root lodging

Saturated soils can also cause loss of N fertilizer by either denitrification (loss of N to the atmosphere, mainly as nitrous oxide gas) or leaching (movement of N beyond the rooting zone). For any of these losses to occur, N should be present in the mobile nitrate (NO_3^-) form. Depending on the fertilizer application time and source, most of the N may still be in the stable ammonium (NH_4^+) form. However, the conversion to nitrate happens quickly as soil temperature continues to increase. Under wet spring planting conditions, corn may respond to in-season N applications if a large portion of early-applied N is lost to these processes. If corn remains N deficient later in the season, expect considerably higher levels of stalk rot.

Another condition associated with extended periods of cool, wet soils is commonly referred to as *cold weather crown stress*. Internal stalk cells in the crown nodes can become "leaky" when cell membranes become chilled and oxygen is limited because of the saturated soils. Hybrids with "southern" genetics are more susceptible to this problem than are northern types. Plants may recover from this damage, but they will be much more susceptible to stalk rot later in the season if hot, dry temperatures occur, since water and nutrients cannot be efficiently moved through the damaged crown.

Figure 3. The corn plant is showing symptoms of cold-weather crown stress. Photo by Doug Jardine, K-State Research and Extension.

The best advice is to scout your corn after the water drains from the fields. Check the appearance of new leaves and the standability of the corn.

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2. Sidewall compaction from planting into wet soils

Conducting field work -- including planting, tillage, or traffic in general -- after wet weather can cause soil compaction, particularly sidewall compaction in the seed furrow. The worst cases of sidewall compaction are seen after a field has been planted when the soil was too wet, followed by a period of dry weather. If the soil stays moist, the roots can usually grow through the walls of the seed furrow. However, if the soil gets dry, the roots can have a harder time growing through that seed furrow wall, and instead grow along the furrow, resulting in what is referred to as sidewall compaction (Figure 1).

Figure 1. Sidewall and seed zone compaction in heavy clay soil. Photo by Stu Duncan, K-State Research and Extension.

With corn, the plants might look fine for a while, but the symptoms of this problem will probably show up after the plants reach several inches tall. Symptoms can mimic drought stress, nutrient deficiency, or both (Figures 2 and 3).

Figure 2. Potassium deficiency in a field with sidewall and seed zone compaction in a wet, clayey soil. Photo by Stu Duncan, K-State Research and Extension.

Figure 3. Planting into a cold, saturated soil resulted in sidewall compaction, leading to crown rot and "chronic" corn. Photo by Stu Duncan, K-State Research and Extension.

Since there are not any good ways to fix sidewall compaction once it exists, the best practice would be to avoid creating the problem in the first place. This means waiting until soils are dry enough to plant. The way to test for this is to dig down to the desired planting depth and make a ball with the soil. Next, see if the ball will crumble or crack apart, or if it deforms like molding putty. If it crumbles, it is ready to plant. If it deforms, it would be best to wait before resuming field operations. Even waiting as little as half a day could make a big difference.

Other considerations

- Planting too shallow: Planting shallow in wet soil may lead to wheel compaction below the seedling depth. This results in limited downward root growth and seeds growing horizontally.
- Too much down pressure: If you must work in wet soil, then the down pressure of the row unit and press wheels needs to be reduced to limit compaction around the seed.
- Soil structure: Tilled soils often lack proper soil structure, causing the standard closing wheel to pinch the sidewalls over the seed from additional pressure. This is frequently a concern in heavier-textured soils, i.e., higher clay content.

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3. Get ahead of weeds: Preplant herbicide options for grain sorghum

Effective weed control is essential for Kansas grain sorghum producers to achieve strong yields. One of the best management practices for effective weed control is planting grain sorghum into clean, weed-free fields. Grain sorghum planted in a weed-free field, coupled with a strong residual program up front, will start strong and outcompete late-emerging weeds. Once the crop reaches canopy, less sunlight will reach the soil surface, thereby reducing weed emergence. In contrast, grain sorghum planted in fields already infested with weeds will be at a competitive disadvantage for limited resources like soil water, soil nutrients, and sunlight for photosynthesis (Figure 1). Also, the chances of chemical weed control failures after crop establishment are higher if grain sorghum is established in an already weed-infested field.

Figure 1. Kochia, an early emerging weed, infesting a field to be planted to grain sorghum, Photo by Jeremie Kouame, K-State Research and Extension

In dryland production systems of western Kansas, conservation tillage is a common practice. This practice helps retain more soil water and increases crop residue on the soil surface, which supports crop intensification. Higher residue amounts also benefit soil health by reducing soil erosion from wind and water, improving soil organic carbon accumulation, and enhancing soil structure. Conservation tillage systems rely on herbicides for effective preplant management of existing weeds, making subsequent weed management strategies more effective.

Preplant herbicide options ahead of grain sorghum are limited, and atrazine has been the basis of most chemical weed control programs in Kansas grain sorghum. Some of the options available can be found below.

Atrazine can be applied as early preplant, PPI, PRE, and POST. It has some activity on grasses like foxtails, but is considered a broadleaf herbicide. It will control susceptible populations of kochia, pigweeds, morningglories, mustards, and ragweeds. From a weed control standpoint, two major constraints with atrazine are the large number of atrazine-resistant weed populations and enhanced atrazine degradation. Both limitations are the result of repeated use of the herbicide. Enhanced degradation occurs when soil microorganisms adapt to atrazine exposure and break the molecule down faster. As a result, the length of residual control may be reduced.

2,4-D. For preplant burndown applications, low-volatile esters are more effective in controlling weeds and are preferably used over amine formulations. But, sorghum can be injured by carryover from preplant 2,4-D. Therefore, growers should follow label guidelines. In burndown mixtures, 2,4-D will help control susceptible populations of winter annual weeds like dandelion, prickly lettuce, horseweed, and evening primrose, and early spring-germinating weeds like ragweed and lambsquarters.

Dicamba provides control of susceptible emerged broadleaves and has a moderate residual control of germinating weeds (pigweeds, wild buckwheat, and lambsquarters). Mixtures of dicamba (8 to 16 oz/a) and atrazine (1 to 2 pints/a) in early spring are good options for kochia control.

Glyphosate provides a broad-spectrum control of glyphosate-susceptible weeds present in the field. Glyphosate resistance is widespread in the state, and the herbicide is often mixed with 2,4-D or dicamba for a broader spectrum and increased control.

Sharpen provides control of many broadleaf weeds like common lambsquarters, marestail, mustards, nightshade, Palmer amaranth, redroot pigweed, wild sunflower, and velvetleaf. Sharpen can be surface-applied preplant or incorporated and has excellent broadleaf burndown activity. It may be tank-mixed with other herbicides, including Clarity, atrazine, and glyphosate. Applying Sharpen to sorghum that has emerged will result in significant crop injury.

Gramoxone can only be handled and applied by certified applicators and is a nonselective, nonresidual contact herbicide often used for preplant burndown of weeds. Apply in clean water or clear fertilizer solutions to thoroughly cover actively growing annual weeds 1 to 6 inches tall. The rate depends on weed size. Application with atrazine and/or nitrogen carrier may enhance activity.

Reviton is a new group 14 (PPO-inhibiting) contact herbicide developed for nonselective broadleaf and grass weed control or suppression when applied to actively growing weeds. A section 24(c) Special Local Need Label has been released for reduced plant back interval to grain sorghum in Kansas. Applied at 1 fl oz/A, grain sorghum should be planted at least 3 days after application, and when applied at 2 fl oz/A, grain sorghum should be planted at least 7 days after application.

Group 15 herbicides. Residual control of weeds that have not emerged can be achieved by including a Group 15 herbicide with a burndown application. *S*-metolachlor (Dual Magnum, others) can be applied up to 45 days before planting seed treated with Concep III safener. Similarly, if safened seed is used, acetochlor (Warrant, others) or dimethenamid-P (Outlook, others) can be applied. Products that contain pyroxasulfone (Zidua, others) are not labeled for use in grain sorghum.

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 and follow all label instructions.

For more detailed information, see the "2025 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide or check with your local K-State Research and Extension office for a paper copy.

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4. Nitrogen fertilizer considerations for grain sorghum

Sorghum is very efficient in using nutrients from the soil due to its large fibrous root system.

Typically, nitrogen (N) is the nutrient most frequently lacking in soil. Nitrogen recommendations vary based on expected yield, soil texture, cropping sequence, and environment.

Residual N in the soil profile

Grain sorghum is very efficient at using residual N in the soil profile. This is particularly important due to recent drought conditions that reduced yields or led to crop failure in Kansas. Nitrogen not used by the previous crop can remain in the soil profile, particularly in dryland environments, and will be available for sorghum in the next crop rotation. K-state guidelines recommend taking soil samples at a depth of 24 inches to assess the amount of profile N through soil testing and adjust the fertilizer N rate accordingly.

The current K-State N recommendation guidelines include efficiency factor adjustments based on crop and fertilizer management (https://bookstore.ksre.ksu.edu/pubs/MF2586.pdf). Adjust the N requirement by 20 pounds of available N per acre for each 1.0% soil organic matter measured on the surface 6 inches. Fertilizer management practices affecting the crop's N use efficiency include fertilizer placement, timing, rate, and source.

Fertilizer placement

Nitrogen recovery efficiency is affected by fertilizer application methods. For example, injecting urea-containing fertilizers below the surface in no-till or reduced tillage systems can minimize ammonia volatilization and N immobilization losses. However, when urea or urea-containing fertilizer is surface applied and not incorporated or does not receive more than 0.25 inch of rainfall or irrigation following application, significant ammonia loss might occur and reduce fertilizer efficiency. If desired, application of urease inhibitor products can prevent volatilization losses for 14-21 days when the fertilizer is surface applied to no-till or high residue systems. These products can be viewed as an insurance policy to prevent volatilization until an incorporating rainfall (exceeding 0.40") or irrigation event occurs.

In general, there are minimal agronomic differences among N sources when properly applied. A recent K-State study in Hays found that subsurface application of 60 lb/acre urea produced grain sorghum yields comparable to broadcast applications of about 85 lb N/acre (Figure 1). In that same study, grain yields with subsurface urea application were similar to broadcast ESN, Super U, or urea plus NBPT (urease inhibitor). This particular example showed a 25 lb N/acre savings compared to broadcast application when N losses are minimized (Figure 1).

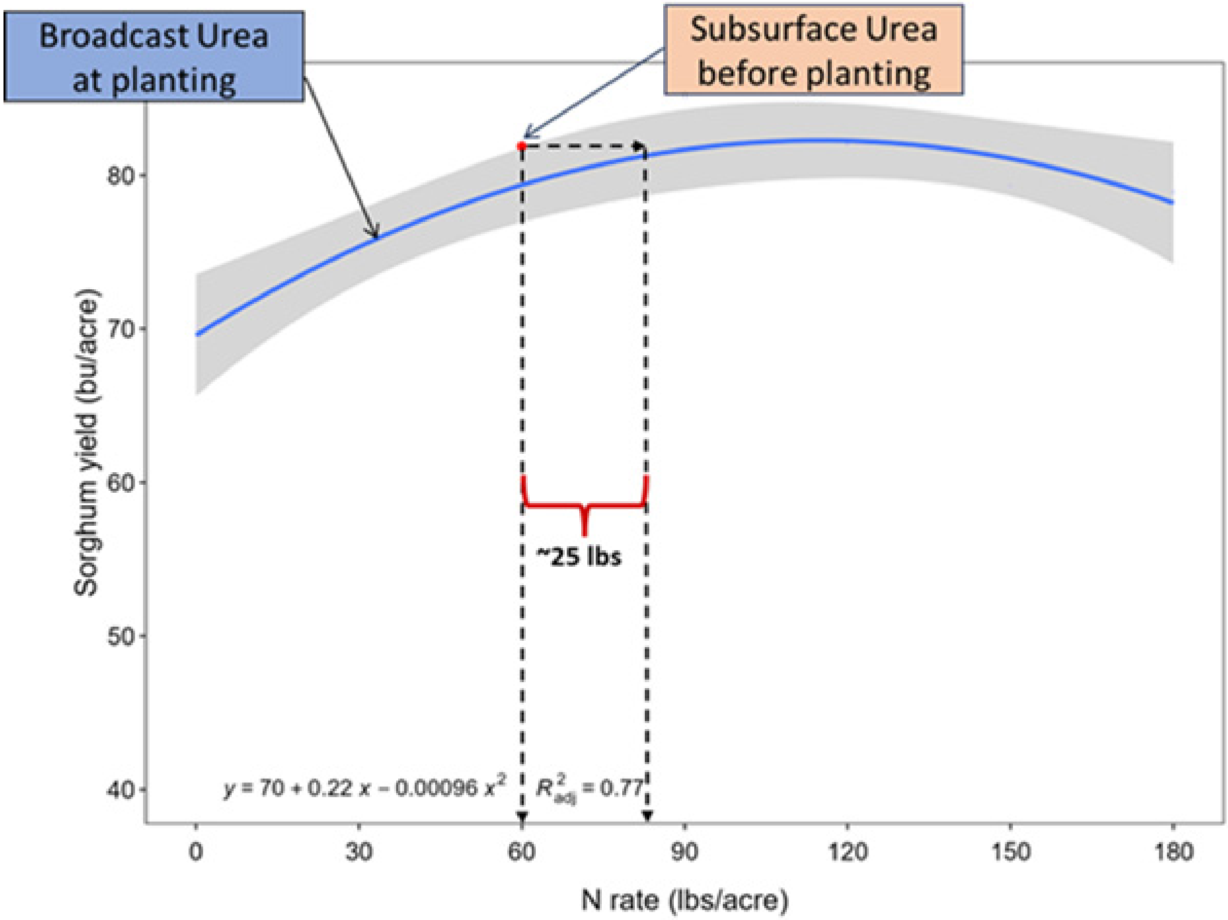

Figure 1. Grain sorghum response to broadcast versus subsurface urea application in 2021 at Hays, KS. Graph by Dorivar Ruiz Diaz, K-State Research and Extension.

Fertilizer application timing

Time fertilizer application so N is available when needed for the rapid growth stages between the five-leaf and boot stages. Preplant N applications in late fall or early spring will have little leaching loss in dryland systems except on sandy soils. On sandy soil, delay preplant N applications until late spring; sidedress or split N applications to improve recovery efficiency (spring and sidedressed). Make sidedress N applications no later than the five-leaf stage.

Assessing soil water storage at planting

In dryland environments, sorghum response to fertilizer N is dependent on a combination of soil water at planting and in-season precipitation. In dryland, measuring the depth of moist soil could provide a measure of water stored at crop planting. Results of a 32-year study in Hays, KS, showed that the depth of moist soil determined at planting with a Paul Brown probe could be used to fine-tune N application rates for sorghum. In this study, grain yield increased by 3.9 to 8.2 bu/acre per inch of available soil water at planting for the unfertilized control and the 60 lb N/a rate (Figure 2).

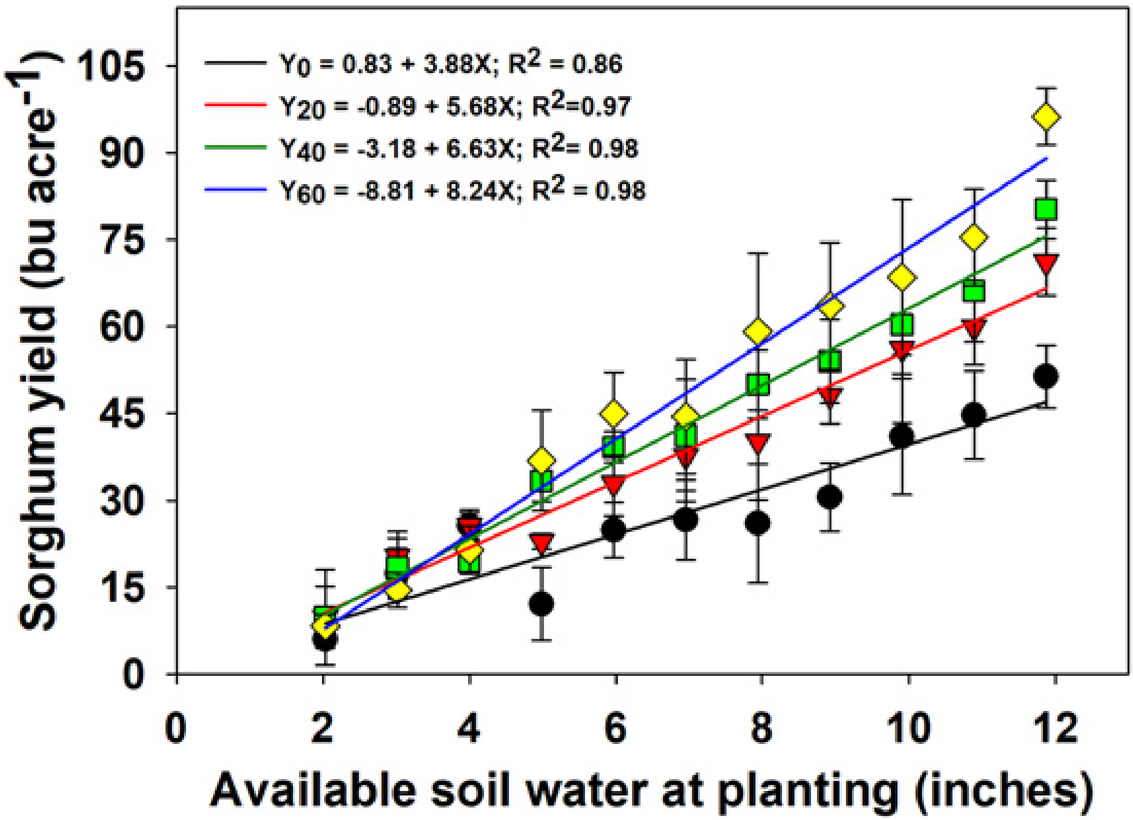

Figure 2. Relationship between available soil water and grain sorghum yield at four fertilizer nitrogen rates averaged from 1972 to 2002 in Hays, KS (0, 20, 40, and 60 lbs N/acre). Graph by Augustine Obour, K-State Research and Extension.

Summary of key points

- Sorghum efficiently uses leftover soil N—test soil to 24 inches to adjust N rates.
- Apply N below the surface to reduce losses and boost fertilizer efficiency.
- Urease inhibitors can help protect surface-applied urea from volatilization.
- Time N applications for rapid growth stages.
- In dryland, more soil moisture at planting = better N response and yield.

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5. Sorghum planting considerations: Planting date and hybrid maturity

The most critical planting practices affecting sorghum performance are planting date, hybrid maturity, seeding rate, and row spacing. This article on planting dates and hybrid maturity complements a companion article on seeding rate and row spacing.

There is considerable variation in environmental stresses during the growing season for grain sorghum as you move across Kansas from east to west. Tailoring management to local conditions is essential to reduce the impacts of stress on the crop and maximize yield potential.

Planting date

Grain sorghum can be planted over a wide range of dates (Figure 1). The key is to time planting so flowering avoids the hottest, driest period of summer but still allows time to mature before frost. Utilizing several planting dates is an easy strategy to spread the risk of one planting date flowering during a period of heat stress. The goal is to establish a uniform stand. Rapid germination and emergence with sorghum occur when the soil temperature is 70°F. Planting too early results in delayed and uneven emergence and reduced stands. Late plantings may not allow the crop to mature before a terminating fall freeze. One potential strategy is to plant fields with low surface residue levels first, they will likely have warmer soils, then progress to heavier levels of surface residue.

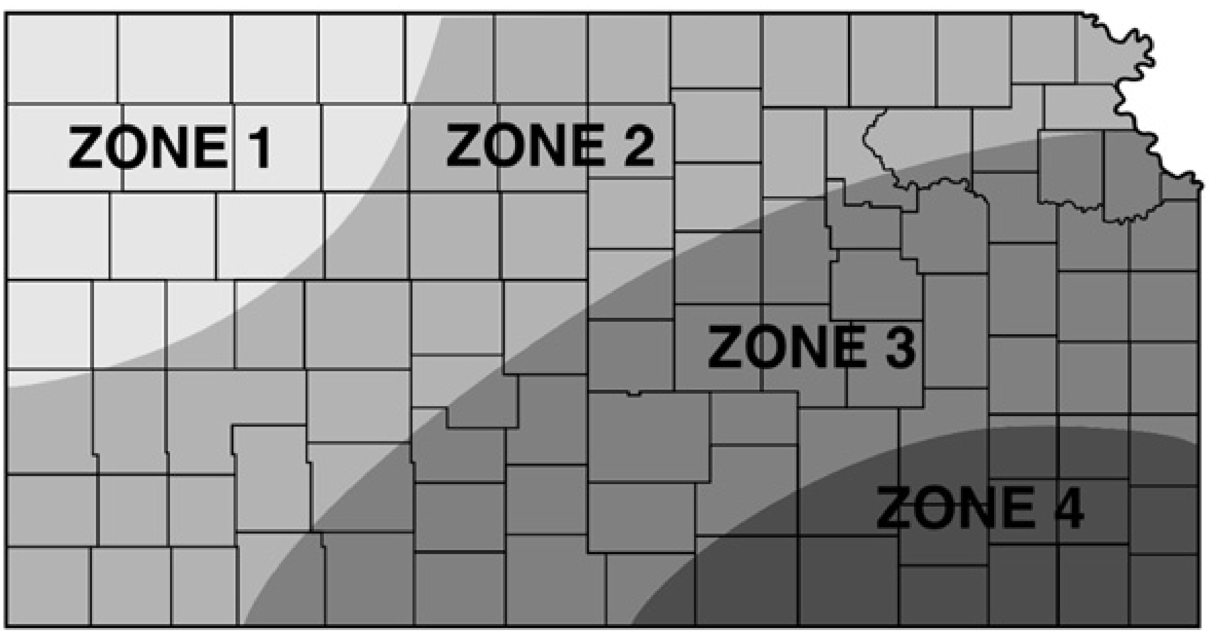

Figure 1. Suggested grain sorghum planting dates: Zone 1 (May 15 to June 10), Zone 2 (May 15 to June 20), Zone 3 (May 15 to June 20), and Zone 4 (May 1 to May 15, June 5 to June 25).

Planting date has some effect on seeding rates (See Sorghum planting considerations: Seeding rates and row spacing). Sorghum will tiller more readily when planted at the optimal date for the location.

Later planting generally results in more in-season stress, which reduces tillering, and late-initiated tillers generally are less productive to final grain yield. As a result, later planting scenarios will be on the high side of the recommended range of seeding rates. The potential for greater tillering with earlier planting dates makes sorghum yields more stable when planted in May and early June than in late June or July.

Hybrid selection

The selection of sorghum hybrids should be based on maturity and other traits, such as resistance to pests, stalk strength, head exertion, seeding vigor, and overall performance. For some production issues like iron chlorosis, hybrid selection is the most important tool available to producers. Hybrid maturity is related to the probability of reaching physiological maturity (black layer formation) one to two weeks before the first freeze.

Use a shorter-season hybrid when late planting occurs, mid-June in north central or northwest Kansas, late June in south central and southwest, or July in eastern Kansas. When planted early, long-season hybrids are recommended for making use of the full length of the growing season (greater yield potential).

Producers should be considerate of biotic (i.e., chinch bugs and sorghum aphids) and abiotic (heat and drought stress) stress when selecting the planting date and hybrid maturity combinations for their operations. Planting early with a medium maturity hybrid could be a way to avoid heat stress during flowering and also avoid sorghum aphid (previously sugarcane aphid) infestation during the boot and early flowering stages. However, chinch bug infestation could be more severe in early planted sorghum, especially when planted near wheat fields.

Key points

- Time planting so flowering avoids the hottest, driest period of summer, but still allows time to mature before frost.
- Establish a uniform stand. Rapid germination and emergence with sorghum occur when the soil temperature is 70°F.
- The selection of a sorghum hybrid based on its maturity should be related to the planting date, the expected duration of the growing season, and the probability that the hybrid will mature before the first freeze event.

Suggested resources for grain sorghum from K-State Research and Extension

"2024 Kansas Performance Tests with Grain Sorghum Hybrids" SRP1189
https://bookstore.ksre.ksu.edu/pubs/SRP1189.pdf

"Sorghum Growth and Development" poster (updated in 2023)
https://bookstore.ksre.ksu.edu/pubs/MF3234.pdf

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6. Sorghum planting considerations: Seeding rate and row spacing

The most critical planting practices affecting sorghum performance are seeding rate, row spacing, planting date, and hybrid maturity. This article on seeding rate and row spacing complements a companion article in this eUpdate issue on planting dates and hybrid maturity.

Sorghum plants can compensate and adjust to diverse environmental conditions by modifying the number of tillers, seeds/head, and seed weight. For sorghum, seeds/head is the yield component that varies the most.

Seeding rates and plant populations

Recommended plant populations range from 23,000 to 90,000 plants per acre, depending on average annual rainfall (Table 1), with recommended populations of up to 110,000 plants under irrigation. Because of sorghum's ability to respond to environmental conditions, final stands can vary by at least 25 percent from the recommended values without significantly affecting yields.

Table 1. Grain sorghum recommended seeding rate, plant population, and row spacing based on average annual rainfall.

Avg. Annual Rainfall (inches)	Seeding Rate (x1,000 seeds/acre)*	Recommended Plant Population (x1,000 plants/acre)	Within-row Seed Spacing (70% emergence)		
			10-inch rows	20-inch rows	30-inch rows
< 20	30-35	23-27	21-18	10-9	7-6
20 to 26	35-64	25-45	18-10	9-5	6-3
26 to 32	50-80	35-55	13-8	6-4	4-3
> 32	70-125	50-90	9-5	4-2	3-2
Irrigated	110-150	80-110	5-4	3-2	2-1

** Assuming 70% field emergence.*

Lower seeding rates can minimize the risk of crop failure in dry environments. Having more than the recommended number of plants per acre results in fewer fertile and productive tillers and thinner stems, reducing yield in drier environments and increasing susceptibility to drought. Sorghum can compensate for good growing conditions by adding tillers or increasing head size. However, insufficient plants/acre will cap yield potential in better environments and a higher final plant population will be needed to maximize yields under high-yielding environments.

Planting date is a consideration when selecting a target seeding rate (the companion eUpdate article "Sorghum planting considerations: Planting date and hybrid maturity"). Seeding rates should be increased when planting late to compensate for reduced tiller production. Increase rates by 15-20 percent if planting later than the optimal window for your location in the state (Figure 1 of the companion article). Late planting generally results in less tillering due to increased in-season plant stress, and tillers that are initiated are less likely to be productive and contribute to final grain yield, thus decreasing the plant's ability to compensate for inadequate stands.

Row spacing

The other factor that can influence yield is row spacing. Narrow rows increase early-season light interception and water use, provide faster canopy closure, reduce evaporation losses, and improve suppression of late-emerging weeds. Narrow rows can aid in maximizing sorghum yields in high-yield environments. A comparison between wide (30-inch) vs. narrow (15-inch) row spacing showed an overall yield benefit of 4 bushels per acre with narrow rows, with narrow rows out-yielding wide rows in 71 percent of all observations. The most consistent response to narrow rows was seed when yields were above 70 bushels per acre. Research in southwest Kansas showed a variable response to narrow rows over wide rows, with an advantage to narrow rows in two years, no response in one year, and a disadvantage to narrow rows in the other year (Table 2).

Table 2. Grain sorghum yield of four narrow-row (7.5" and 15") plant populations compared to wide-row (30") at Garden City and Tribune, KS.

Seeding rate	Garden City		Tribune	
(Seeds/acre)	2016	2017	2016	2017
20,000 Narrow[1]	87	43	135	81
40,000 Narrow	103	49	136	95
60,000 Narrow	101	61	137	102
80,000 Narrow	97	67	137	101
Planted[2]	118	49	130	90

[1]Narrow row plots were seeded on 7.5" row spacing in 2016 and 15" row spacing in 2017.
[2]Planted plots were seeded at 27,000 seeds per acre in 2016 and 20,000 seeds per acre in 2017 at Garden City and at 40,000 seeds per acre in both years at Tribune.

Should populations be adjusted with narrow rows?

Research indicates that different row spacing doesn't necessarily change the plant population required to maximize yield. However, populations on the higher end of the recommended range for a given yield environment would be encouraged with planting on narrow rows. An important consideration is the seeding equipment used to plant narrow-row sorghum. Some equipment designs will struggle to obtain consistency of depth, and seed-to-soil contact is customary with row-crop planters, thus reducing final emergence. It's also important to recognize that the metering systems typically employed for narrow-row seeding generally do not singulate seed, but work on a volumetric basis. With these types of equipment, it is important to follow manufacturers' recommendations for metering modifications for low rates of small seed. Also, producers should consider differences in seeds/lb for the sorghum hybrids that they plant and perform calibrations when changing seed sizes.

Should row spacing be adjusted for planting dates?

Research in Kansas has shown that there was essentially no difference in yield between 15- and 30-inch rows for late-May plantings. However, there was a 10-bushel yield advantage for 15-inch rows for late-June plantings.

Planting depth

Seed placement is also a critical factor when planting sorghum. The optimum seed placement for sorghum is between 1-2 inches deep. Shallower or deeper planting depths can affect the time between planting and emergence, affecting early-season plant uniformity. Seed should be placed deep enough to ensure placement into uniform soil moisture and temperature conditions while not exceeding the capability of seedling emergence.

Summary

- Determine your desired population based on average rainfall and expected growing conditions.
- Sorghum can compensate for good growing conditions by adding tillers or increasing head size.
- Consider using narrower row spacing to close the canopy sooner and potentially capture greater yields in yield environments of 70 bushels per acre or more.
- Adjust seeding rates higher when in late-planting scenarios

Suggested resources for grain sorghum from K-State Research and Extension

"Narrow-row Grain Sorghum Production in Kansas" MF2388
https://bookstore.ksre.ksu.edu/pubs/MF2388.pdf

"Sorghum Growth and Development" poster (updated in 2023)
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7. Wheat disease update: Fusarium head blight and leaf spot risk elevated in Kansas

Recent wet weather has brought on an increased risk of Fusarium head blight (scab) and leaf spotting diseases in parts of the state. Here we walk through current disease risks in Kansas and fungicide application reminders.

The weather is currently favorable for scab development in southeast Kansas, and risk is elevated moving into central Kansas according to wheatscab.psu.edu (Figure 1). This model considers weather conditions favorable for scab development over a 14-day window. It will be important to carefully watch risk in fields that are approaching the critical application window for a fungicide application (flowering- Feekes 10.5.1). The highest risk will be in fields of scab-susceptible varieties that are planted back into corn residue. Continued wet weather around flowering will increase our risk for scab in the state. For a reminder about the scab ratings for individual varieties, please refer to the Kansas Wheat Variety Guide: https://bookstore.ksre.ksu.edu/pubs/mf991.pdf.

Figure 1. Fusarium head blight (scab) risk for May 1, 2025. Red areas indicate regions with the most favorable weather for scab over the last two weeks, and yellow indicates less favorable weather. This model is calibrated for susceptible varieties of winter wheat. This interactive map can be accessed at www.wheatscab.psu.edu.

Scab infection occurs at flowering, but symptoms are not visible for 14-21 days after infection (Figure

2). Because of this, we cannot scout for scab the way we would stripe rust or other foliar diseases. Fungicide decisions need to be made according to the weather-based risk and the field's yield potential. Not only can scab lower yield and test weights, it also produces a mycotoxin (vomitoxin, DON) and can produce grain that is "scabby" which can sometimes lead to discounts.

Figure 2. Fusarium head blight (scab) infection often begins with bleaching of infected spikelets and will progress throughout the head. When humidity is high, orange fungal structures are visible on the outside of the spikelet. The grain from infected heads may appear lightweight, white, or pink. Photos by: K-State Research and Extension.

Reminders for scab fungicide applications

Fungicide products - Fungicides such as Miravis Ace, Prosaro, Sphearex, Prosaro Pro, and Folicur (and generic equivalents) are known to suppress scab (head blight). Specific fungicide performance for scab and other diseases can be found here: https://bookstore.ksre.ksu.edu/pubs/EP130.pdf. Other fungicides are not labeled or not recommended for scab control, particularly products containing strobilurin (FRAC group 11 – azoxystrobin, pyraclostrobin, etc.). As a reminder, all products that control scab will also control stripe rust and other foliar fungal diseases.

Timing - Fungicides are most effective against scab when applied at early flowering (Feekes 10.5.1), but can provide protection even when applied later in the flowering window. It is important to pay attention to pre-harvest intervals at this point of the season and follow guidelines provided on product labels. The products listed above either have a 30-day pre-harvest interval (cannot be applied within 30 days of harvest) or cannot be applied after Feekes 10.5.4 (end of flowering, watery ripe growth stage).

It is important to remember that early flag-leaf fungicide applications will have little to no effect on scab control.

Rainfastness - With the current wet weather, we are getting many questions about fungicide rainfastness. Rainfast time is defined as the period of time that needs to pass between the application of a fungicide and a rainfall event where the fungicide will not lose efficacy. This information is often not included on the product label or is ambiguous. Rainfast time will be variable with temperature and canopy moisture, but most products recommended for wheat in Kansas will be rainfast within two hours, and likely within one hour under most conditions. Rainfastness is improved when a product is applied with a non-ionic surfactant.

Residual life - The residual life of the fungicide application is influenced by the product used, environment, and rate of application. In general, products belonging to the triazole and strobilurin classes of fungicide will run out of gas (you may start to see symptoms) after 21 days (about 3 weeks). Small differences in residual life among products typically do not result in large differences in grain yield. Some newer products are promoted as having much longer residual lives, but we don't have university research that supports those claims.

Seed treatments - Seed treatments do not have any influence on disease development during the growing season, as the fungicides in these seed treatments wear off within 30-45 days. Seed treatments can improve the emergence of seed from infected fields as this pathogen can cause seedling diseases when infected seed is planted back.

Stripe rust update and outlook

We received our first observations of low levels of stripe rust in Kansas this week from both Ford and Labette Counties (Figure 3). To date, confirmed reports in Kansas have been limited to single fields in each of these counties. We are continuing to scout and monitor the situation and will update the regional map with new observations: https://wheat.agpestmonitor.org/stripe-rust/.

Overall, the risk of widespread losses in Kansas remains low. Although we have been experiencing favorable weather for stripe rust, disease levels have remained low in states to our south (see update from Oklahoma:
https://spotlight.okstate.edu/wheat-pathology/2025/04/28/wheat-disease-update-april-28-2025/), limiting the number of spores available to infect our crop during critical growth stages.

For more information on the stripe rust outlook, see our Agronomy eUpdate article from last week (https://eupdate.agronomy.ksu.edu/article/should-you-spray-stripe-rust-and-other-wheat-diseases-to-watch-for-in-kansas-638-4). Scouting efforts should continue over the next few weeks as we move through critical growth stages across the state. Scouting efforts will be particularly critical in the Northwest portion of the state, where the wheat growth stages are much less advanced. As a reminder, the probability of a positive return on a fungicide application greatly diminishes when disease pressure is absent.

If you detect stripe rust, please contact me at andersenk@ksu.edu) so we can verify and update regional maps.

Figure 3. Counties where wheat stripe rust has been confirmed as of May 1, 2025. Real-time updates can be monitored at https://wheat.agpestmonitor.org/stripe-rust/.

Leaf spot diseases are starting to take hold

Although stripe rust levels remain low, wet weather has brought on higher-than-usual leaf spot disease pressure in parts of Kansas (Figure 4). As a reminder, tan spot and similar leaf diseases (Septoria tritici blotch and Stagonospora nodorum blotch) survive in wheat crop residue left over from past seasons. These pathogens develop spores in residue that are splashed or blown up to lower leaves. When weather conditions are right, these diseases can move into the upper canopy and cause yield losses. Periods of cool, wet weather after flag leaf emergence can favor disease progression. Fields with leaf spots moving into the upper canopy may benefit from a fungicide application. More information on fungicide efficacy for these leaf spotting diseases can be found here: https://bookstore.ksre.ksu.edu/pubs/EP130.pdf.

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8. Corn leafhopper update and new dashboard to track presence in Kansas

Corn stunt spiroplasma (CSS, *Spiroplasma kunkelii*) and its associated vector (corn leafhopper, *Dalbulus maidis*) were first confirmed in Kansas during the 2024 corn season. Although most of the positive reports were from field corn, we also confirmed CSS in sweet corn. High levels of disease were found in late-planted and double-cropped corn, leading to potential yield reductions. Corn leafhopper acquires pathogens within minutes of feeding on infected corn plants, but it can take up to 30 days for the leafhopper to be able to infect healthy corn plants during feeding events. The corn leafhopper can also transmit additional pathogens, either singly or in combination with CSS. To date, only CSS has been confirmed in Kansas.

The corn leafhopper is relatively simple to identify under magnification (Figure 1). These leafhoppers are light tan to yellowish-white in color and approximately 1/8″ long. Two distinct dark spots between the antennae and eyes are very characteristic of this species. Nymphs lack wings and can vary in color. Like most leafhoppers, all stages move quickly when disturbed and hide in shaded areas of corn plants. All stages can be sampled using a sweep net; a video showing how to sample for corn leafhoppers in mature corn canopies can be found here: https://youtu.be/QgLuWWSwHWU.

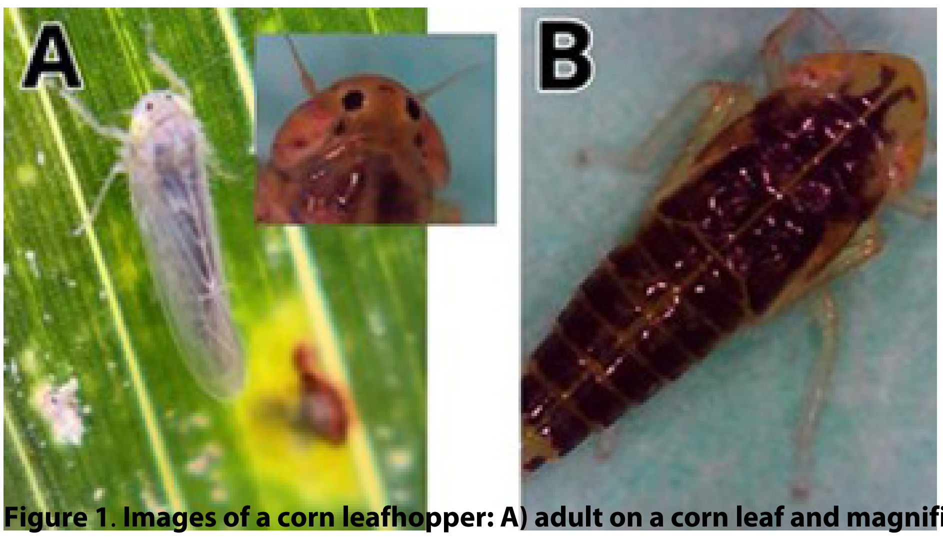

Figure 1. Images of a corn leafhopper: A) adult on a corn leaf and magnified view of the two black spots between the eyes; and B) nymph showing dark brown coloration and developing wing pads. Photos courtesy of Brian McCornack, K-State Research and Extension.

Early detection of corn leafhoppers is a vital component of corn stunt management. To help communicate monitoring results in real-time, a monitoring system and webpage have been created to help growers track corn leaf hopper, corn stunt, and other corn diseases (kscorn.com/corndisease). A collaborative effort between K-State Plant Pathology, Agronomy, and Entomology departments, the Kansas Corn Commission, Kansas Independent Crop Consultants, K-State Research & Extension Ag Agents, and Corteva has been initiated to monitor at least three counties in each crop reporting district for corn leafhoppers (Figure 2).

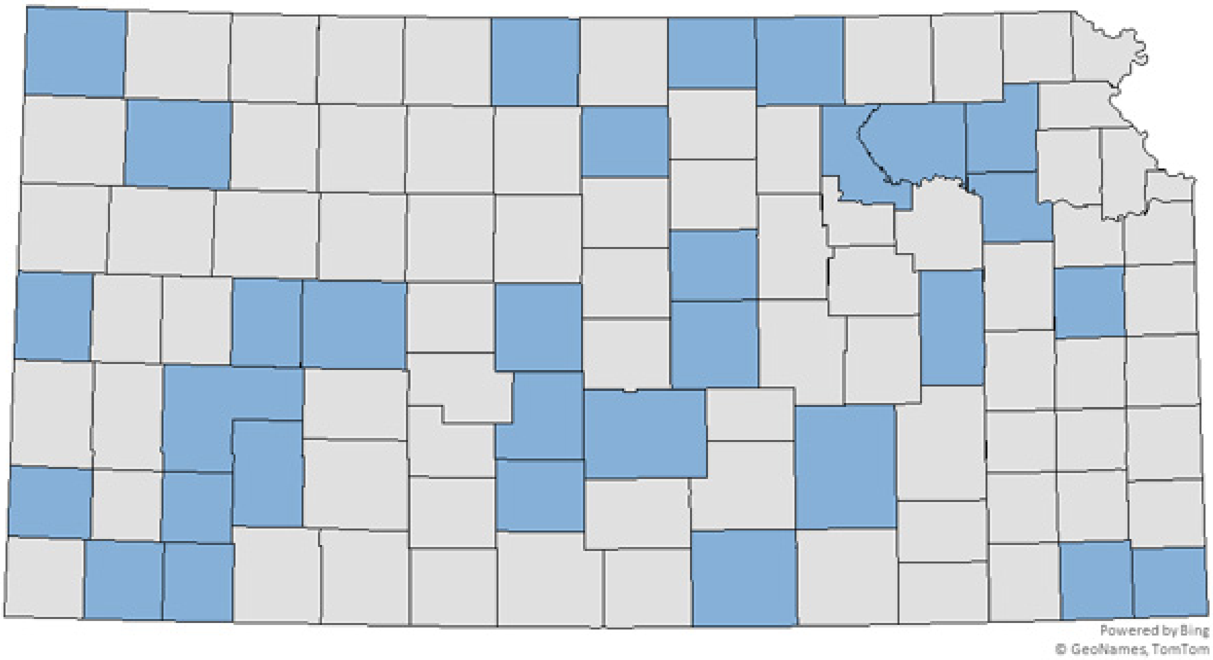

Figure 2. In-season K-Trap monitoring counties. Counties that are blue have at least one trap for CLH and will be monitored weekly during the 2025 Corn Season.

About 33 Kansas participants have already received sticky traps and are beginning to ship them back to track the number and location of corn leafhoppers in the state. Monitoring will continue for 40 weeks. This will help us understand our real-time risk during the growing season. The leafhoppers that are trapped will be tested to see if they carry the pathogens that cause corn stunt disease. Any detections will be added to a map that tracks corn leafhopper detections in Kansas and other states (kscorn.com/corndisease). Additionally, we will be offering free corn stunt disease testing for Kansas corn growers during the 2025 season. Free testing will include both types of samples: corn tissue and corn leafhopper.

The corn leafhopper map, along with a map that tracks the detection of corn stunt pathogens, can be found on Kansas Corn's website: kscorn.com/corndisease. This page also includes maps for tar spot and southern rust, as well as video updates from K-State Research and Extension.

Corn leafhopper status in 2025

In 2025, the corn leafhopper has only been detected in seven counties in Texas. In Kansas, traps received from Cherokee, Jackson, Haskell, Saline, and McPherson Counties during the week of 04/14/2025 through 04/21/2025 had no corn leafhoppers (Figure 3).

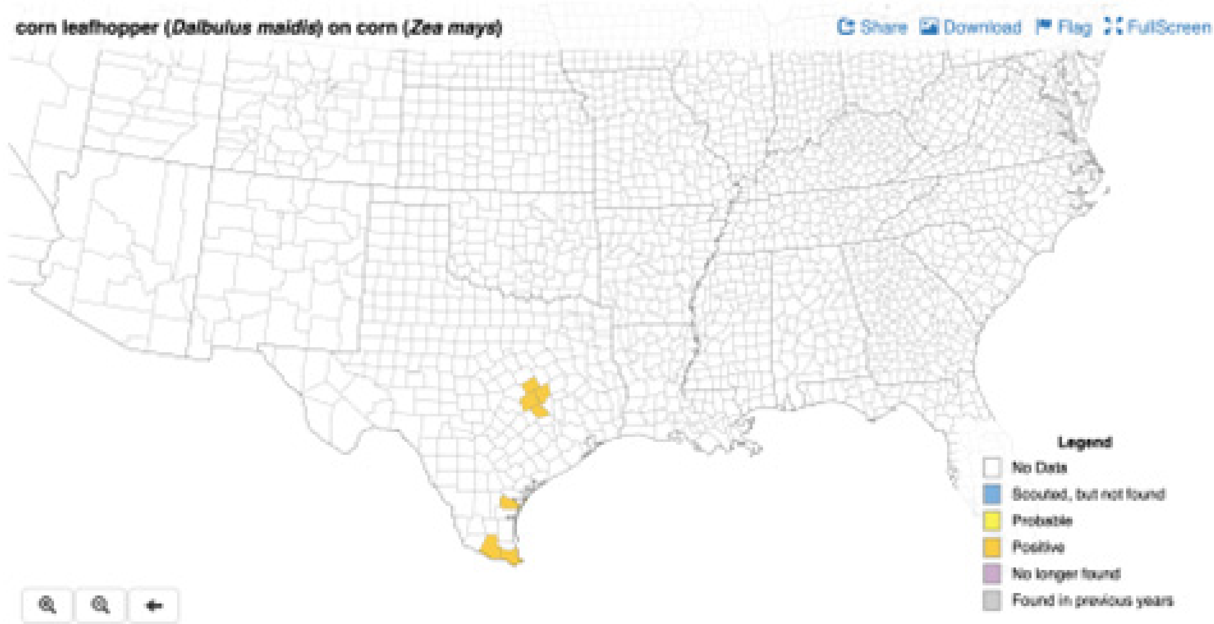

Figure 3. Corn leafhopper (Dalbulus maidis**) distribution in 2025.**

Visit kscorn.com/corndisease **for more information.**

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9. Plan now for volunteer corn control

We can debate whether or not volunteer corn is truly a "weed," but it can certainly be a problem in soybean fields following corn (Figure 1). According to research conducted in South Dakota, soybean yield loss was 8 to 9% when volunteer corn density was about one plant per ten square feet. Yield loss increased to 71% at volunteer corn densities of about one plant per square foot. Conversely, other scientists concluded that corn grain yield is not reduced by volunteer corn, so long as the volunteer corn was harvested along with the hybrid corn. However, the authors also noted negative impacts such as harvest inefficiency, disease occurrences, and poor stewardship of insect-resistant traits.

One of the factors that makes volunteer corn management difficult is the prevalence of glyphosate- and/or glufosinate-resistant varieties and hybrids. In addition, tank mixes with dicamba or 2,4-D to control broadleaf weeds may reduce the effectiveness of glyphosate and Group 2 herbicides like clethodim (Select Max, others) or quizalofop (Assure II, others). However, there are some steps farmers can take early in the growing season to manage volunteer corn.

Figure 1. Volunteer corn emerging with soybeans. Photo by Sarah Lancaster, K-State Research and Extension.

Burndown options

As mentioned above, glyphosate will not control glyphosate-resistant volunteer corn. However, paraquat (Gramoxone, others) will control volunteer corn that has emerged prior to soybean planting. Glufosinate (Liberty, others) will also control volunteer corn -- as long as the corn is not glufosinate-resistant (LibertyLink).

One thing to remember with burndown herbicide applications is that they must come in contact with the growing point to ensure the corn plant will not regrow, which means contact herbicides will be ineffective if applied to volunteer corn smaller than V6. In some cases, tillage may be the most effective option to avoid regrowth.

At planting options - soybeans

In research conducted at the University of Nebraska, pre-emergence applications of sulfentrazone in combination with imazethapyr, cloransulam, metribuzin, or chlorimuron (Authority Assist, Authority First, Authority MTZ, or Authority XL) reduced volunteer corn growth compared to non-treated controls. Other treatments, including flumioxazin (Valor, others) alone or in combination with chlorimuron (Valor XLT) or cloransulam (FirstRate), or fomesafen + metolachlor (Prefix) or saflufenacil + imazethapyr (Optill), *did not* reduce volunteer corn growth. There are no residual herbicide options to control volunteer corn at the time of field corn planting.

Over-the-top options

Group 2 herbicides (Select Max, Assure II, Fusilade, Poast, and others) are typically very effective over-the-top options for volunteer corn control in soybeans. However, research from Indiana and Canada suggests that volunteer corn control by clethodim formulations without "fully loaded" surfactants can be reduced up to about 60% when applied with glyphosate or glyphosate plus 2,4-D and up to about 75% when applied with glyphosate plus dicamba. The reduction in control can be minimized by increasing the rate of the Group 2 herbicide to the maximum labeled rate or by using a more aggressive adjuvant. Research from North Dakota suggests that adding a high surfactant oil concentrate (HSOC) can improve volunteer corn control by tank mixtures of clethodim plus glyphosate, but neither NIS nor AMS improves control.

One potential option to control volunteer corn in emerged corn is to use an Enlist® corn hybrid. Enlist corn hybrids can be sprayed with Assure II herbicide, which would control glyphosate and/or glufosinate-resistant volunteers.

For more detailed information, the "2025 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide is 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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10. 2025 Kansas Wheat Plot Tours - Preliminary schedule

The Department of Agronomy and K-State Research and Extension will host several winter wheat variety plot tours in different regions of the state starting May 13, 2025. Please make plans to attend a plot tour near you to see and learn about the newest available and upcoming wheat varieties, their agronomics, and their disease reactions. Below is a preliminary list of plot tour dates, times, and locations with directions. This list will be continuously added to and updated in the coming weeks.

May 13 – Tuesday

Time	County	Location	Agent	Directions
8:00 AM	Harper		Jenni Carr	The location is ½ mile west of K2 on US 160
12:00 PM	Kingman	Kingman	Grace Schneider	Conrardy Seeds Test Plot. Location: 7681 SW 80 Ave, Kingman, KS 67068

May 14 – Wednesday

Time	County	Location	Agent	Directions
11:00 AM	Barber	Isabel	Matt Rhodes	North of Isabel on the intersection between Main Street and SE 120th St.
6:00 PM	Pratt	Pratt	Jenna Fitzsimmons	Begin at Bucklin Tractor Implement (BTI)-Pratt. Then travel 2 miles west and 1/2 mile south. All are invited to supper at the Blasi Farm after the tour.

May 15 – Thursday

Time	County	Location	Agent	Directions
7:30 AM	Marion	Hillsboro	Rickey Roberts	Highway 56 and Kanza Rd, just east of Hillsboro
10:00 AM	Comanche/ Kiowa		Levi Miller/ Madison Hansen	The field is the northwest corner at the intersection of HWY 183 and Avenue C, Coldwater, KS 67029. Lunch to follow tour at Scoular, 15240 183 HWY, Greensburg, KS 67054
12:00 PM	Harvey	Newton	Anne Pitts	Lunch at noon at Camp Hawk. Plot tour following lunch. Plot is at 3400-3494 SW 48th St., Newton, KS. From Camp Hawk, go 1.5 miles east to S. West Rd, turn 1 mile south to 48th St., turn west about 400 yards. The plot is on the north side of the road.
6:00 PM	Pawnee		Kyle Grant	US 156 Junction, Go 2 miles south, then 2 miles back west and ½ south. Legal SW Quarter 7-22-18 in Pheasant Ridge in

				Pawnee County

May 16 – Friday

Time	County	Location	Agent	Directions
9:00 AM	McPherson	Marquette	Shad Marston	PATRICK PLOT - Marquette. Marquette Rd & Highway 4
11:30 AM	McPherson	Moundridge	Shad Marston	A free lunch sponsored by MKC will be held at MKC Learning Center, 221 W Hirschler Str., Moundridge. GALLE PLOT - The plot tour will start at 1 PM in Moundridge. 1/8 West of 23rd Avenue on Cheyenne Road
1:00 PM	McPherson	Inman	Shad Marston	SCHROEDER PLOT - Inman. Between 4th & 5th Avenue on Cheyenne Road

May 19 – Monday

Time	County	Location	Agent	Directions
9:00 AM	Reno	Buhler	Patrick Bergkamp	1 mile north of Buhler
4:00 PM	Finney	Garden City	Logan Simon	Southwest research and extension center spring field day
6:00 PM	Sumner	Belle Plaine	Randy Hein	Belle Plaine- 2 miles East of Belle Plaine, South on Rock Rd 3 miles to E 60th, 1 mile East, NE corner

May 20 – Tuesday

Time	County	Location	Agent	Directions
8:00 AM	Sedgwick	Andale	Jeff Seiler	1/2 mile south of intersection 247th St W & 21st St N
8:00 AM	Parsons	Parsons	Gretchen Sassenrath	Southeast research and extension center
10:45 AM	Sedgwick	Haysville	Jeff Seiler	1901 E 95th St S, Haysville, KS 67060 (John C. Pair Center)
6:00 PM	Sumner	Caldwell	Randy Hein	Caldwell- Barry Bones Patton Research Farm, Hwy 81 & Sumner RD east of Caldwell, ¾ south, plots on east side north of lane

May 21 – Wednesday

Time	County	Location	Agent	Directions
7:30 AM	Dickinson	Abilene	Rickey Roberts	at the farm of Kevin Harris, S. of Abilene, just west of Hwy 15

8:30 AM	Barton	Hoisington	Stacy Campbell	North of Hoisington on HWY 281. Turn West on NW 190 Rd. (Galatia/Susank blacktop). Go 1 mile, turn south onto NW 50th Ave, go 1/8 mile on the West side. Cooperator/farmer Tim Maier.
11:30 AM	Ellsworth	Lorraine	Craig Dinkel	Lorraine Plot is located on Avenue W. From the black top 10th road, go 2.5 miles west.
6:00 PM	Russel	Russel	Craig Dinkel	Russell plot is located at the FFA field at North Copeland Street & East State Street.

May 22 – Thursday

Time	County	Location	Agent	Directions
10:30 AM	Smith		Sandra Wick	Turn south off of Highway 36 at Athol, Kansas. Go through town a couple of blocks, then turn west at Trinity Ag. Then south on the first road for about ¼ mile, the plot is on the west side.
1:30 PM	Jewell		Sandra Wick	Turn south off Highway 36 on 30th Road and go 3 miles. The plot is on the west side.
4:30 PM	Mitchell		Sandra Wick	South of Beloit on Hwy.14 to blacktop Hunter Road (X Road), then 4 miles west to 220 Road, then 1 mile south to Y Road, then east about ½ mile, on the south side.
5:00 PM	Edwards	Kinsley	Baley Doggett	Head West out of Kinsley on 1st Street (or L Road) ½ mile, the plot is on the North side of the blacktop—meal to follow tour.
6:30 PM	Sumner	Conway Springs	Randy Hein	Conway Springs- 922 W 140th Ave north of Conway Springs, 1 mile east on 140th, south on Springdale 0.01 mile, east side of road

May 23 – Friday

Time	County	Location	Agent	Directions
8:00 AM	Ottawa	Minneapolis	Jay Wisbey	1.5 miles west of K-106 Highway on Justice Road
11:00 AM	Saline	Solomon	Jay Wisbey	From Old 40 Highway West of Solomon. Go South on N Gypsum Valley Road 2.5 Miles and then West ½ mile on E

				Stimmel Road

Plots tours scheduled after May 23 are being finalized, and details will be updated soon. Stay tuned to the eUpdate for any changes to this schedule.

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11. K-State winter canola field day set for May 14

Kansas State University and the Great Plains Canola Association will host a field day in May to highlight winter canola variety development, research, and marketing.

According to K-State canola breeder Mike Stamm, the field days are an opportunity to see winter canola variety trials in the field and learn about current and future varieties. He said management decisions to ensure a successful harvest will be discussed. Stamm notes that questions related to marketing of the crop are still critical.

"It's important to give producers an opportunity to get their questions answered," Stamm said. "We want to help producers grow canola with confidence and put everyone in the best position possible to harvest and market a successful crop this summer."

The field day will be held at the South Central Experiment Field southwest of Hutchinson, beginning at 10 a.m. From the intersection of US Highway 50 and South Dean Road west of Hutchinson, drive south 4 ½ miles on South Dean Road. The experiment field address is 10620 S. Dean Rd.

The Great Plains Canola Association will sponsor a free noon meal.

To RSVP for the catered meal in Hutchinson, please contact Troy Lynn Eckart at the K-State Agronomy Extension Office at sprite@ksu.edu or 785-532-5776. More information is also available from Mike Stamm at 785-532-3871 or mjstamm@ksu.edu.

12. 2025 Spring Crop Field Day in southeast Kansas

Kansas State University Research and Extension invites producers, ag professionals, and community members to attend the 2025 Spring Crop Field Day: Wheat, Weeds, and Weather on May 20, 2025, at the Southeast Research and Extension Center, located at 25092 Ness Road, Parsons, Kansas.

This half-day event will provide timely insights into wheat production, weed management, and climate outlooks tailored for southeast Kansas. Registration begins at 8:30 a.m**.**, with presentations and tours running from 9:00 to 11:45 a.m. Lunch will be provided free of charge thanks to generous sponsors.

Program highlights include:

- **Soft and Hard Wheat Variety Plot Tours**: See the latest wheat varieties in the field and learn about their performance under local conditions.
- **Weed Management in the Changing Environment**: Tina Sullivan, K-State Regional Agronomist, will discuss strategies for managing weed pressure in the face of evolving herbicide resistance and environmental challenges.
- **Climate Update and Weather Outlook**: Chip Redmond, K-State Climatologist, will provide an update on weather and forecasts impacting cropping decisions.
- **Hard and Soft Red Wheat Varieties for Southeast Kansas**: Allan Fritz, K-State Wheat Breeder, will share insights on wheat genetics and variety selection for optimal performance in the region.

Producers will have the opportunity to interact directly with K-State specialists, ask questions, and discuss management practices relevant to their farms.

Registration is free and can be completed online by scanning the QR code in the event flyer or visiting WildcatDistrict.k-state.edu/events. You may also call 620-421-4826 for more information.

Lunch will be provided courtesy of sponsors, including Corner Post Crop Insurance, Thomas Implement Inc., AGChoice, Producers Cooperative Association, Wheat Alliance, McCune Farmers Union Coop Association, Bartlett Co-op Association, Frontier Farm Credit, and R&F Farm Supply.

Make plans to join us on May 20 for this informative and hands-on field day!

2025 Spring Crop Field Day:

Wheat, weeds, and weather

May 20th | 8:30AM - 1:00PM
Southeast Research and Extension Center
25092 Ness Rd. Parsons, KS

Sponsored by:

Corner Post Crop Insurance
Thomas Implement Inc.
AGChoice
Producers Cooperative Association
Wheat Alliance
McCune Farmers Union Coop Association
Frontier Farm Credit
Bartlett Co-op Assn
R&F Farm Supply
K-State Research and Extension

Soft and Hard Wheat Variety Plot Tours

Weed Management in the Changing Environment
Tina Sullivan, Regional Agronomist

Climate Update and Weather Outlook
Chip Redmond, K-State Climatologist

Hard and Soft Red Wheat Varieties for Southeast Kansas
Allan Fritz, K-State Wheat Genetics

Registration 8:30 - 9:00
Presentations & Tours 9:00 to 11:45
Lunch (Free Courtesy of Sponsors)

Register Here
or call 620-421-4826
or visit Wildcatdistrict.ksu.edu/events