Issue 996

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Extension Agronomy

eUpdate

03/21/2024

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Spring planting in Kansas: Soil temperature and moisture status

The planting date is one of the most critical factors for row crops. Farmers should consider basing this decision on soil temperature and moisture rather than just calendar dates.

Soil temperatures

After a cooling trend during the second week of March, air temperatures across Kansas seem to be back to normal again, but the forecast indicates we may fall below normal in the coming days. Therefore, planting decisions should consider the current soil temperatures and the short-term (7-day period) forecast.

For the 7-day period between March 15 and 21, average soil temperatures at 2 inches across Kansas districts ranged from 43°F to 44°F (Figure 1). You can monitor soil temperatures across the state by using the Kansas Mesonet's soil temperature tracking tool at https://mesonet.k-state.edu/agriculture/soiltemp/.

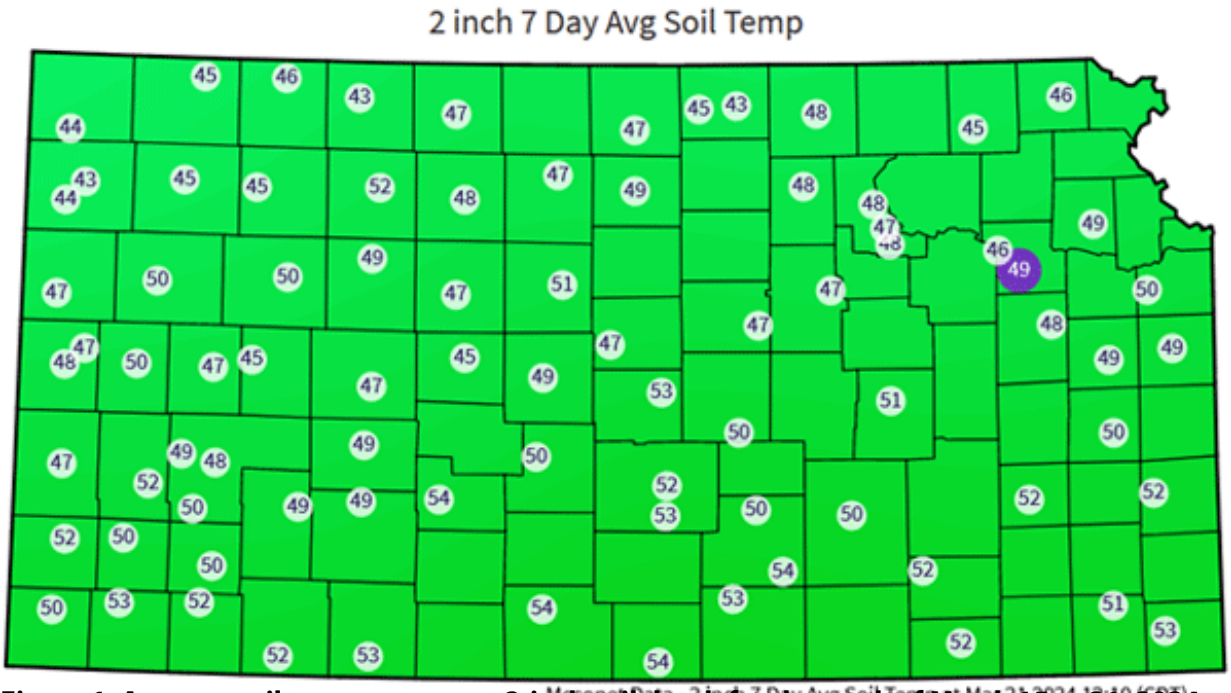

Figure 1. Average soil temperatures at 2-inch soil depth for the week of March 15 to 21, 2024. Source: Kansas Mesonet. (https://mesonet.k-state.edu/agriculture/soiltemp/)

Projections for the next 6-10 days lean toward below-normal temperatures statewide (Figure 2). In parallel, there is a slight favor for above-normal precipitation in the northwest, with the remainder of the state having equal chances of at/below/above normal moisture, which may contribute to maintaining cool soil temperatures (Figure 3).

It is worth mentioning that topsoil temperature differences could be large depending on multiple factors. Actual changes in any given field will be affected by several factors, including soil type, soil moisture, residue cover, tillage, landscape position, and others. For example, wet soils under a no-tillage system are expected to warm up slower. Dry soils will fluctuate more rapidly, matching air temperatures, particularly if skies are clear.

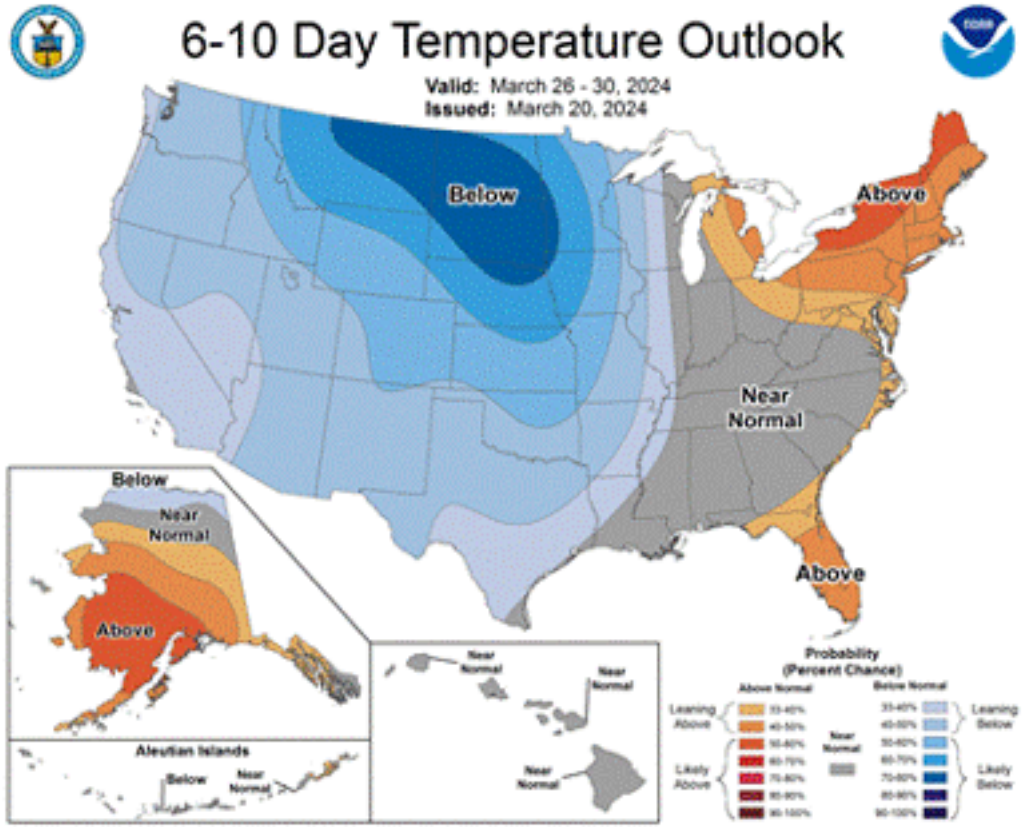

Figure 2. 6 to10-day temperature outlook for March 26-30, 2024. Source: NOAA.

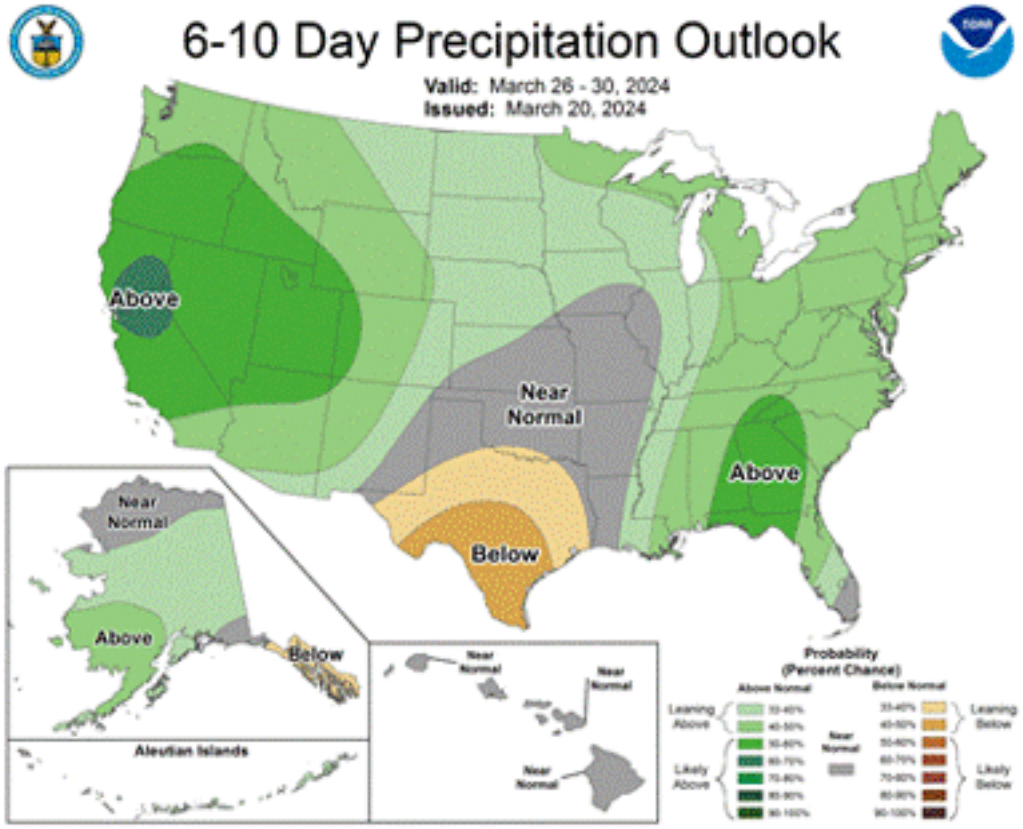

Figure 3. 6 to10-day precipitation outlook for March 26-30,2024. Source: NOAA.

Soil moisture

Current soil moisture is lowest across portions of southwest and south-central Kansas (Figure 4). Recent precipitation has improved moisture in the north and eastern parts of the state over the last week. However, actively growing vegetation has increased demands in these areas as well.

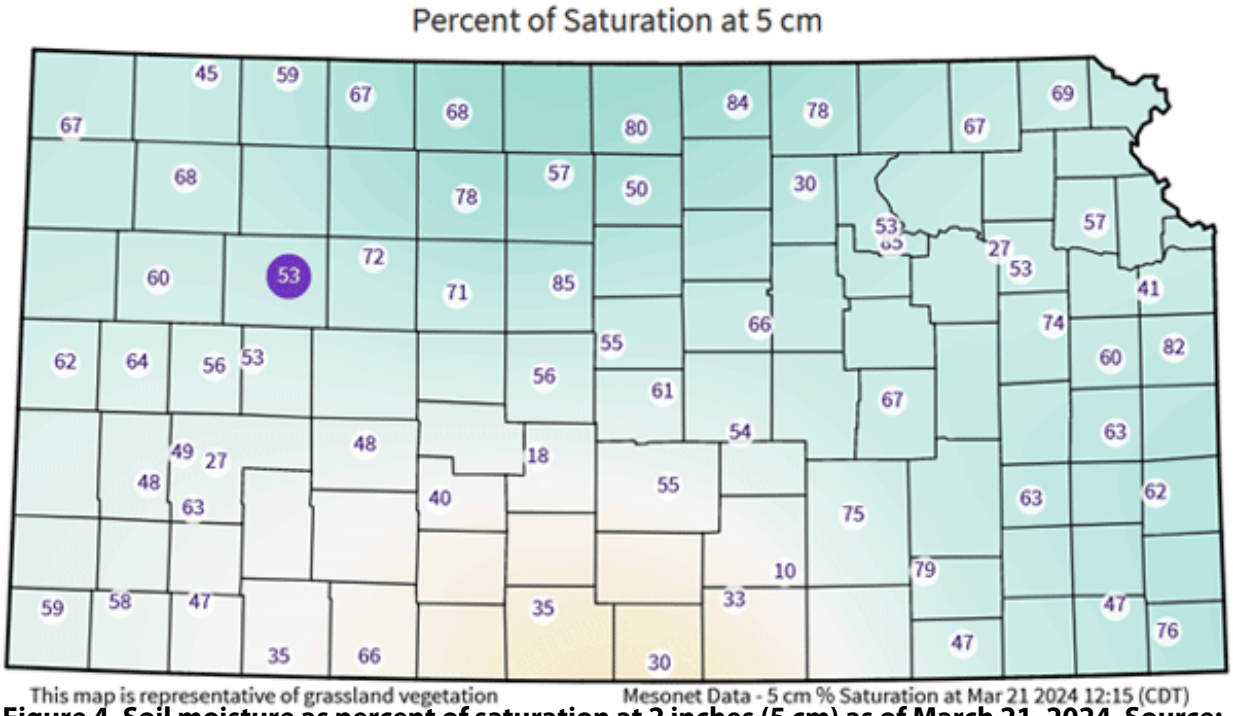

Figure 4. Soil moisture as percent of saturation at 2 inches (5 cm) as of March 21, 2024. Source: Kansas Mesonet https://mesonet.k-state.edu/agriculture/soilmoist/

The largest departure in precipitation occurred in south-central Kansas over the last two weeks (Figure 5). No substantial change in moisture is expected in this region, and March is likely to end on the dry side for much of southwest and south-central Kansas (Figure 3).

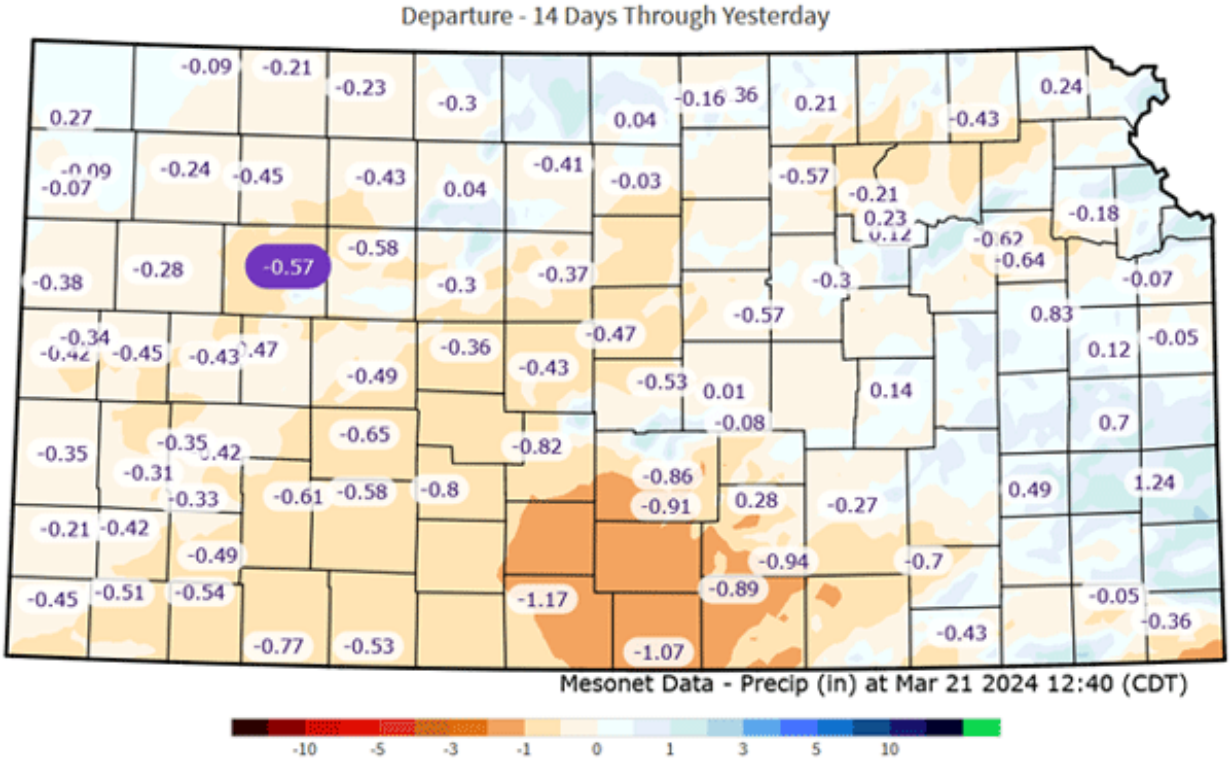

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Figure 5. Departure from normal precipitation for the last two weeks ending March 21, 2024. Shades of orange indicate below normal precipitation. Source: Kansas Mesonet.

Management considerations

Optimal soil temperature for crop emergence

Every summer row crop has an optimal soil temperature for its emergence. Corn's minimum temperature for germination and early growth is 50°F. When soil temperatures remain at or below 50 degrees after planting, the damage to germinating seeds can be particularly severe.

Uniformity and synchrony in emergence are critical and primarily achieved when soil temperatures are consistently above 55°F. Uneven soil temperatures around the seed zone can produce non-uniform crop germination and emergence. Lack of uniformity in emergence can greatly impact corn potential yields. Competition between early-emerged and late-emerged plants, as well as competition from weeds, may negatively impact biomass and grain production. Compensation mechanisms like tillering have limited potential compared to other crops' compensation mechanisms, like branching in soybeans.

Impact of a hard freeze on corn

Corn is also more likely than other summer crops to be affected by a hard freeze after emergence if it is planted too early. The impact of a hard freeze on emerged corn will vary depending on how low the temperature gets, the intensity and duration of the low temperatures, field variability, residue distribution, tillage systems, soil type, moisture conditions (more severe under dry conditions), and the growth stage of the plant. Injury is most likely on young seedlings or plants beyond the V5-6 growth stage when the growing point is above the soil surface.

The average day for last spring freeze (32°F) varies considerably across the state (Figure 6). From southeast to northwest Kansas; the earliest last spring freeze date is April 1-14 and latest is May 5-12. Thus, corn planting dates before the second week of April in the southeast or the second week of May in the northwest would represent a high risk of suffering from a late spring frost damage.

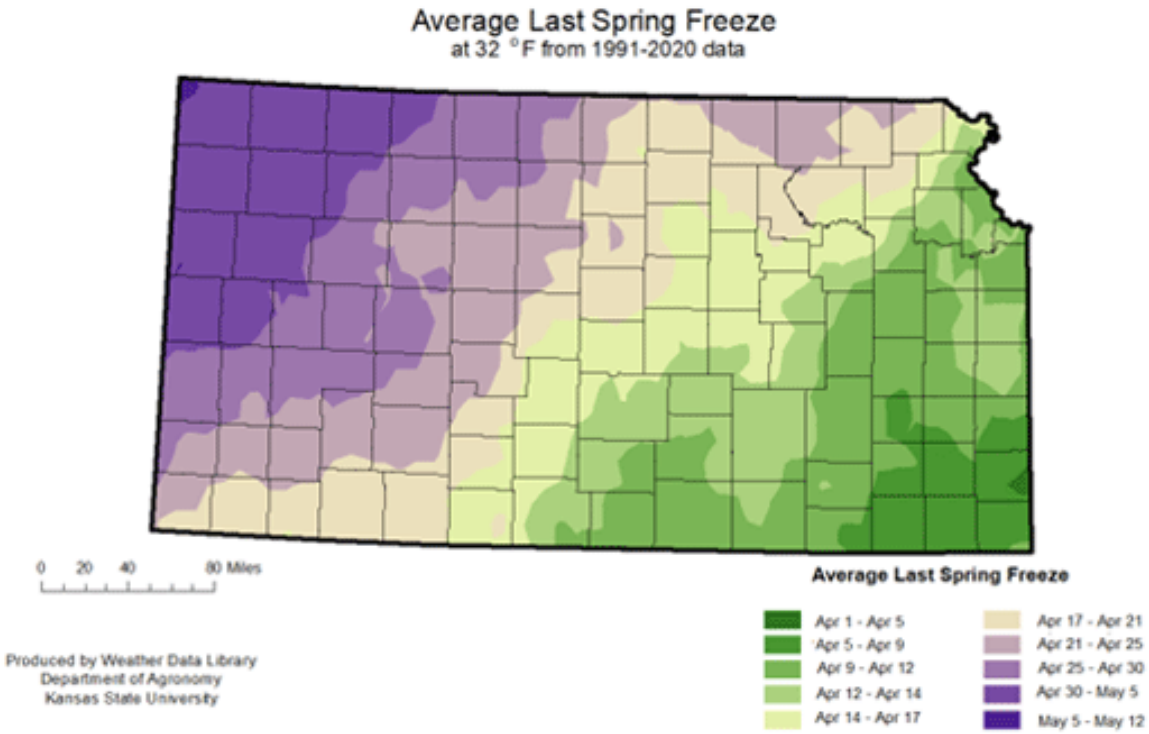

Figure 6. Average last spring freeze (32 degrees F) for Kansas. Source: Kansas Mesonet.

More information about the planting status of summer row crops will be provided in upcoming issues of the Agronomy eUpdate. Stay tuned!

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2. Considerations for early fungicide applications on wheat in 2024

Research at K-State and in other regions continues to demonstrate that it is often possible to achieve high levels of foliar disease control with a single fungicide applied between flag leaf emergence and heading growth stages. The yield response to this later fungicide application is influenced by the level of disease risk (amount of disease and predicted weather conditions), variety resistance to the most threatening fungal diseases, crop yield potential, foliar fungicide efficacy, and other factors.

Fungicides can also be applied as an early application made between "spring green-up" and jointing. This application may provide some yield benefits in some fields and years. Early fungicide applications may result in small yield advantages due to a reduction in early disease establishment in the lower canopy. This may be particularly true for "leaf spot diseases" such as tan spot or Septoria leaf blotch that survive in wheat residue and can establish early in the year. Yield benefits are most likely in wheat fields planted back into wheat stubble and when weather conditions are wet enough to favor fungal disease development.

If you decide to make an early application, it is important to factor that into the full-season fungicide program. Many active ingredients have use restrictions, where a limited amount of an active ingredient can be applied during a single season. It is important to ensure that early fungicides do not limit options for fungicide applications at flag leaf (which have the potential for higher yield protection in conducive disease years).

Advantages and limitations of split applications

These are some advantages to making an early application:

Low cost. There is no additional cost for application if the fungicide is tank mixed with other products, such as liquid nitrogen fertilizer or herbicide. However, the optimal timing for an early fungicide application is not until after the wheat has jointed – with one or two joints present. This is usually sometime in mid-to-late March in southern Kansas and later in northern Kansas. Top-dressed nitrogen and many postemergence herbicides should be applied before this stage to be most effective and, in many cases, to be within label restrictions, so the optimal timing of both applications may not match. A separate trip for an early fungicide application adds to the cost of production.

Since the payoff for an early application is less certain than with later applications, it is perhaps best to consider using a low-cost generic fungicide for the early application and saving more expensive products, if desired, for the later application.

Provides suppression of early-season disease caused by tan spot, powdery mildew, and septoria leaf blotch that overwinter locally in Kansas. The benefits of fungicides applied at green-up are more sporadic for diseases like leaf rust and stripe rust, which are less likely to survive the winter in Kansas. The rust diseases typically blow into the state from Texas and Oklahoma during the spring and often become established as the crop transitions from jointing to flag leaf emergence. If a field has hot spots of stripe rust at jointing or earlier, a fungicide application made at jointing could help suppress the developing epidemic. However, a second application will be needed to protect the flag leaves during the early stages of grain development for maximum yield protection.

The limitations of early-season fungicide application include:

Leaves not present at the time of application will not be well protected. Therefore, these applications will not control leaf rust or stripe rust epidemics that come in from the south at later stages of growth. The early applications are most effective when combined with a second, later fungicide application.

Additional product costs may not pay off under some conditions, especially this growing season when the crop's yield potential may be limited by drought. Remember, the second application does the heavy lifting in the dual-application approach. If capital resources are limited because of low prices, investing your money where you are likely to see the largest yield response may be best.

Product rates and restrictions

Producers considering the use of split applications must pay close attention to label restrictions. Every active ingredient in a fungicide has a maximum total amount that can be applied during the season.

For example, if an early application of a generic form of tebuconazole is applied at 4 oz/acre, a subsequent application of any fungicide containing tebuconazole alone or in combination with other ingredients (e.g., premix) around heading could put you over the limit for the crop season. Thus, be sure to read the label to determine the maximum amount of a chemical that can be applied in a single season and the exact amount of a chemical(s) that is in a fungicide.

For information on the efficacy of different foliar fungicide products, refer to the K-State Research and Extension publication *Foliar Fungicide Efficacy Ratings for Wheat Disease Management 2024*, EP130.

Conclusions

The main conclusions we can draw from recent studies in Kansas and Oklahoma are:

- In K-State studies, the greatest average profit has come from the flag leaf application of fungicides. Fungicides applied prior to jointing are less likely to result in a positive profit.
- The likelihood of profit for an early-season fungicide application is greatest for susceptible varieties in continuous wheat systems with a high level of surface wheat residue.
- Fields with hot spots of tan spot, septoria leaf blotch, and stripe rust prior to flag leaf emergence are candidates for an early fungicide application, provided environmental conditions are conducive for further disease development and yield potential of the crop. These applications are often most effective when made around the jointing stages of growth.

Additional resources

KSRE publication *Foliar Fungicide Efficacy Ratings for Wheat Disease Management 2024*.

For information on assessing the need for wheat foliar fungicide, refer to the KSRE publication *Evaluating the Need for Wheat Foliar Fungicides*, MF3057.

Another publication providing good information, from which a few excerpts were used in this article, is Oklahoma State University's *Split Versus Single Applications of Fungicides to Control Foliar Wheat Diseases*, PSS-2138.

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3. Outlook for stripe rust in 2024 Kansas wheat crop

Over the last ten years, stripe rust has been one of the most damaging wheat diseases in Kansas. Several factors contribute to the development and severity of stripe rust in our region within a given year. The stripe rust pathogen typically does not survive in Kansas over the winter but can survive in Texas through the winter months and make its way back north as the weather warms in the spring. Because of this, weather conditions in Texas in the fall and early spring can be important predictors of how bad stripe rust will be in Kansas.

This year, the first stripe rust report we received was from Chillicothe, TX, on January 31, where the disease was starting to take hold. Reports indicated that stripe rust was still active there and in McGregor, TX, in late February. On March 8, moderate to high levels of stripe and leaf rust were reported in wheat breeding nurseries in Castroville, TX (just outside San Antonio). To date, there have been no detections in Kansas yet in 2024. Historically, detections in Kansas before April 15 have been associated with bad stripe rust years. Scouting efforts over the next few weeks will be very important.

How did winter weather look for stripe rust in Texas?

A look at the moisture patterns for 2023-24 indicates there was moderate/high moisture in Texas in the fall (map on the left in **Figure 1**), which may have been favorable for rust development. This pattern of moderate/high moisture has continued through the early spring, which has likely promoted stripe rust sporulation and spread.

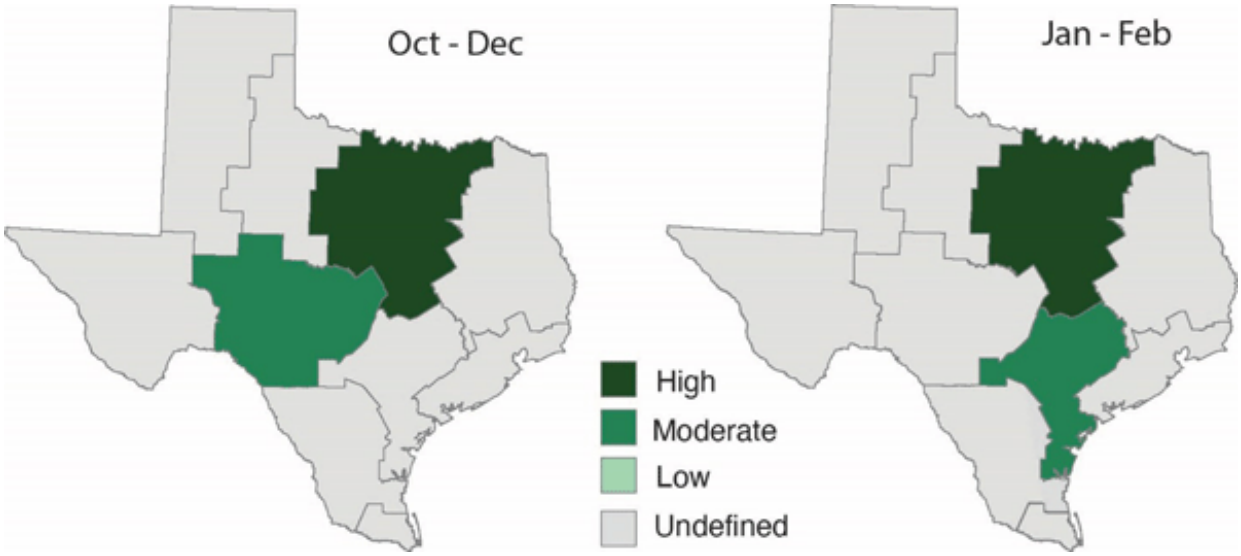

Figure 1. K-State research has shown that the annual severity of stripe rust outbreaks in Kansas can be predicted by soil moisture in key regions of Texas in both the fall and the early spring. In the fall of 2023, soil moisture in Texas was moderate to high (indicated by medium/dark green colors on the map). In Jan-Feb 2024, there was also high moisture in some

of these key regions of Texas. These maps show soil moisture levels based on the "Palmer Z-Index" provided by NOAA-National Centers for Environmental Information.

What does this mean for Kansas wheat?

Early reports of high levels of stripe rust in Texas, along with favorable weather in Texas in the fall and spring, are early indicators that we could have a stripe rust issue in Kansas in 2024. Historically, years that begin like this have ended with high yield losses in Kansas due to this disease. Of course, stripe rust severity in Kansas is still largely driven by weather conditions in the state in the late spring and the varieties planted. Once stripe rust is detected in Kansas, cool evenings and extended periods of canopy moisture will be necessary for disease establishment at levels that would result in yield loss. If the weather turns hot and dry quickly, stripe rust will have fewer opportunities to take hold.

The disease situation can change rapidly, and it is important to continue to scout for signs of disease development as the season progresses. We will continue to provide updates on stripe rust occurrence and weather outlook as we move toward critical growth stages for fungicide applications in Kansas over the next several weeks.

If considering fungicide applications, please see the article in this issue titled *Considerations for Early Fungicide Applications on Wheat in 2024*.

Please contact us (andersenk@ksu.edu) if you detect stripe rust in Kansas so we can update regional maps.

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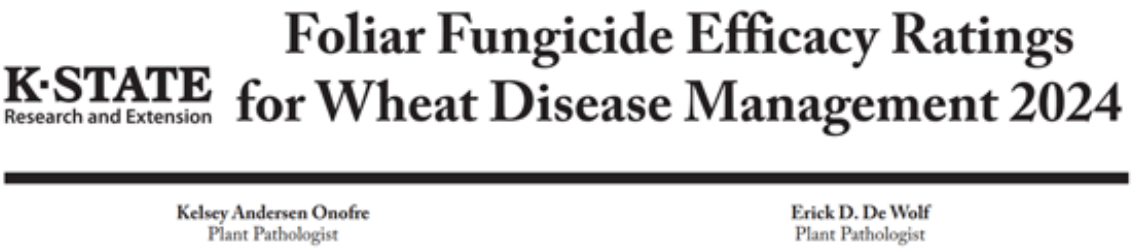
4. Foliar fungicide efficacy for wheat disease management

The K-State Research and Extension publication *Foliar Fungicide Efficacy for Wheat Disease Management* has been updated for 2024. Check out the updated pub here: http://www.bookstore.ksre.ksu.edu/pubs/EP130.pdf.



The recommendations in this publication reflect several years of head-to-head product comparisons in Kansas and many other wheat-producing states. These ratings were verified by members of the North Central Extension and Research Committee (NCERA-184) for managing small grain diseases, which is composed of extension plant pathologists from universities throughout the U.S.

It's important to remember that all efficacy ratings listed here are based on proper application timing. Differences in efficacy among fungicide products were determined by direct comparisons among products in field tests and are based on a single application of the labeled rate as listed in the table. This publication includes fungicides widely marketed in Kansas and is not intended to be a list of all labeled products. Many products have specific use restrictions, which can include the amount of active ingredient that can be applied within a period of time or the number of sequential applications that can be made. Read and follow all use restrictions described on individual product labels prior to use.

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5. Updated soil test interpretations and fertilizer recommendations for Kansas

The Agronomy Soil Fertility Working Group at K-State, led by soil fertility specialist Dorivar Ruiz Diaz, has released an updated version of the popular publication MF2586 "Soil Test Interpretations and Fertilizer Recommendations in Kansas." This publication contains the most recent soil test interpretations for the major crops for the most commonly deficient plant nutrients in Kansas.

Developing sound nutrient management programs involves understanding a wide range of information. Soil test records are an important piece of that information, but other factors, such as soil moisture conditions, land ownership/tenure, crop and cropping sequence, pest management, cultural practices, environmental issues, and other management items, are vital for developing sound nutrient management programs. It is beyond the scope of this publication to detail the ramifications of all these factors, but they should not be overlooked when finalizing nutrient application programs.

The tables, equations, and accompanying information in this publication are the most recent soil test interpretations for major crops for the most commonly deficient plant nutrients in Kansas. These interpretations are valid for interpreting soil test values from the KSU Soil Testing Laboratory and other laboratories using the same soil testing procedures.

Appropriate estimate of expected yield is a key component

Suggested recommended application rates are tied to expected yields for several nutrients. Yield records should be used to set an individual and realistic but progressive expected yield for each field. An appropriate expected yield for a specific field should be high enough to take advantage of high production years when they occur but not so high as to jeopardize environmental stewardship and/or profitability when environmental conditions are unfavorable. Appropriate expected yield should be about 105% of the average yield obtained in a field over the past three to five years.

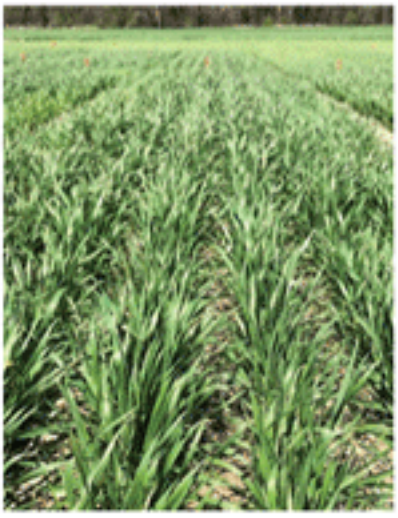
Updated for 2024

Some portions of the publication that were updated include, but aren't limited to:

- Nitrogen recommendations for corn, grain sorghum, and wheat
- Liming recommendations
- Expanded explanations on phosphorus recommendations
- Separate section for potassium recommendations

The full publication is available online at https://bookstore.ksre.ksu.edu/pubs/MF2586.pdf

Soil Test Interpretations and Fertilizer Recommendations in Kansas



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The work was made possible through the committed financial support of the Kansas Fertilizer Research Funds. The Kansas Department of Agriculture has established a "Fertilizer Tonnage Fee,"

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which collects a set amount of money per ton of fertilizer sold or distributed for use in Kansas. Of this amount, $0.04/ton is transferred to Kansas State University for fertilizer-related research.

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6. Army cutworm activity in western Kansas

The army cutworm, also known as the miller moth, is a late fall and early spring pest of several Kansas crops, including wheat. These moths begin migrating into Kansas and neighboring states in the fall from their over-summering locations in the Rocky Mountains (Figure 1). Females lay eggs on the soil surface of freshly cultivated, weedy, or newly seeded fields, with each laying up to 1000 eggs or more. After hatching, caterpillars will begin feeding, causing classic windowpane damage to leaves (Figure 2) and do so until cold weather forces them below ground. Be aware that it is possible for caterpillars to resume feeding on warmer winter days, and mild winters can result in feeding resuming earlier in the spring.

Figure 1. Adult army cutworm, also called a miller moth. Photo from K-State Entomology.

Figure 2. Example of windowpane damage caused by a young army cutworm caterpillar. Photo by K-State Entomology.

High numbers of army cutworm moths were trapped in western Kansas in the fall of 2023 as part of the monitoring efforts of the Kansas Insect Trapping Network. Moths began arriving the first week of October and were active until the first week of November. Trap counts of the moths were particularly high in southwestern Kansas, with almost 2000 moths caught in the month of October at one location. Generally, trap counts of 800 or more moths in an area through October may indicate significant caterpillar activity the following spring, and, in fact, caterpillar activity has been noticeable in wheat fields in several areas of western Kansas so far in 2024 with reports of fields reaching treatable levels in the last two weeks (Figure 3).

Figure 3. Army cutworm caterpillar.

It is recommended that scouting for this pest should be underway in wheat fields of the region. Thin stands or fields may suffer economic damage under stressful conditions with only 1-2 caterpillars per square foot. Typically, treatment will not be necessary until populations average 4-5 per square foot and well-tillered fields under good growing conditions can tolerate up to 10 per square foot without measurable yield loss. If treatment is warranted, various products are available but understand that all these products will negatively impact the beneficial insects common in Kansas wheat fields in the springtime. Thorough scouting is critical to ensure that treatments are justified.

More information regarding this pest and treatment options can be found in the KSRE Wheat Insect Management Guide at http://www.bookstore.ksre.ksu.edu/pubs/mf745.pdf.

Will 2024 bring another record miller moth flight?

In late spring, as caterpillars finish developing, moths will emerge and begin their migration to the Rocky Mountains. Moths present at this time pose no risk to crops as they are not sexually mature and cannot lay eggs. At this point in the season, they are simply a nuisance. In the spring of 2023, record numbers of miller moths plagued many areas of western Kansas, getting trapped in homes and outbuildings, clogging up ventilation and even home furnaces. This record flight of miller moths was likely due to the high number of moths that showed up in the fall of 2022, which deposited large numbers of eggs in the region. Given the number of moths trapped last fall, it is possible that we may see another large miller moth flight this spring in western Kansas.

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7. Insect activity update: Alfalfa weevils

Alfalfa weevil control is problematic in Kansas for several reasons, but probably first and foremost is the weather. Alfalfa weevils are cool weather insects, thus feeding voraciously in spring immediately after hatching for 2-3 weeks, depending upon temperatures. The larvae actively feed 24/7 when the temperatures are above 45°F. However, the Kansas weather in March/April is often windy with rain/snow/sleet/hail – or a combination of all, which makes foliar applications of insecticides difficult because fields may be too muddy, or it's too windy, but the alfalfa weevil larvae are still feeding 24/7. However, weather occasionally helps control weevils, as it did in 2017 and 2018 and has apparently so far this year. Temperatures in the mid-to-lower 20s for a couple of hours will actually kill small larvae feeding in the terminals.

Monitoring several fields in north central Kansas on March 16-20 indicated small larval feeding, causing the characteristic pinprick holes in leaves and ragged terminals, which indicated hatching – but no live larvae were found during this time, 16-20 Mar. One live adult was collected (see Figure 1), but no larvae. However, adults are still depositing eggs in stems, and thus, alfalfa weevil monitoring should continue. At least in north central Kansas, the recent cold weather seems to be helping control weevils. For more information about alfalfa weevil management, please refer to the 2024 KSU Alfalfa Insect Management Guide.

Figure 1. Adult alfalfa weevil and leaf feeding damage. Photo by K-State Entomology.

Some factors other than weather that affect alfalfa weevil control include the timing and gallonage (or carrier) used during application. See the results from the 2023 gallonage study shown in Figure 2 using 8 gallons H_2O/a vs. 15 gallons H_2O/a with other factors the same.

2023		Steward 8 fl oz/a 8 gal H_2O/a #Larvae/10 Stems			Steward 8 fl oz/a 15 gal H_2O/a #Larvae/10			Untreated #Larvae/10 Stems		
	Rep	7 days	14 days	21 days	7 days	14 days	21 days	7 days	14 days	21 days
	1	3	4	8	0	0	1	10	PD	PD
	2	4	2	6	0	2	2	18	PD	PD
	3	6	4	6	2	2	1	18	PD	PD
	4	6	6	PD	1	3	6	19	PD	PD

Figure 2. Alfalfa weevil and gallonage trial. (PD = plants defoliated)

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