Issue 761

K-STATE Research and Extension

Extension Agronomy

eUpdate

08/16/2019

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.

Subscribe to the eUpdate mailing list: https://listserv.ksu.edu/cgi-bin?SUBED1=EUPDATE&A=1

eUpdate Table of Contents | 08/16/2019 | Issue 761

1. Managing low-quality wheat seed following a season with severe Fusarium head blight (head scab) infection

The 2018-19 wheat harvest was affected by severe Fusarium head blight (head scab) in eastern and central Kansas, which can affect the quality of the seed for the next growing season. A direct consequence of head blight is a decrease in test weight (which is a measure of kernels' volume weight or bulk density), as well as decrease in percent germination due to chalky, infected wheat kernels (Figure 1).

Figure 1. Chalky wheat kernels (thumbstones) resulting from severe infection of Fusarium head blight. Photo by Erick DeWolf, K-State Research and Extension.

While many of the severely diseased kernels are removed by the combine during harvest, seed producers in Kansas are reporting up to 40% cleanout this year to bring seed wheat to acceptable test weight standards (seed wheat should have a test weight above 57 pounds per bushel for adequate germination under a wide variety of conditions). This means that producers who stored grain on-farm and are planning to simply plant seed straight out of the bin might be in trouble. Especially this year, there is a need to pursue appropriate seed cleaning, and also to consider a fungicide seed treatment. K-State research conducted in seven locations during 2018-19 showed that improving seed quality through different seed cleaning methods leads to better stand establishment and grain yield even, in a season when Fusarium was minimal (Figure 2). Therefore, the benefits are potentially much larger this year when disease is severe.

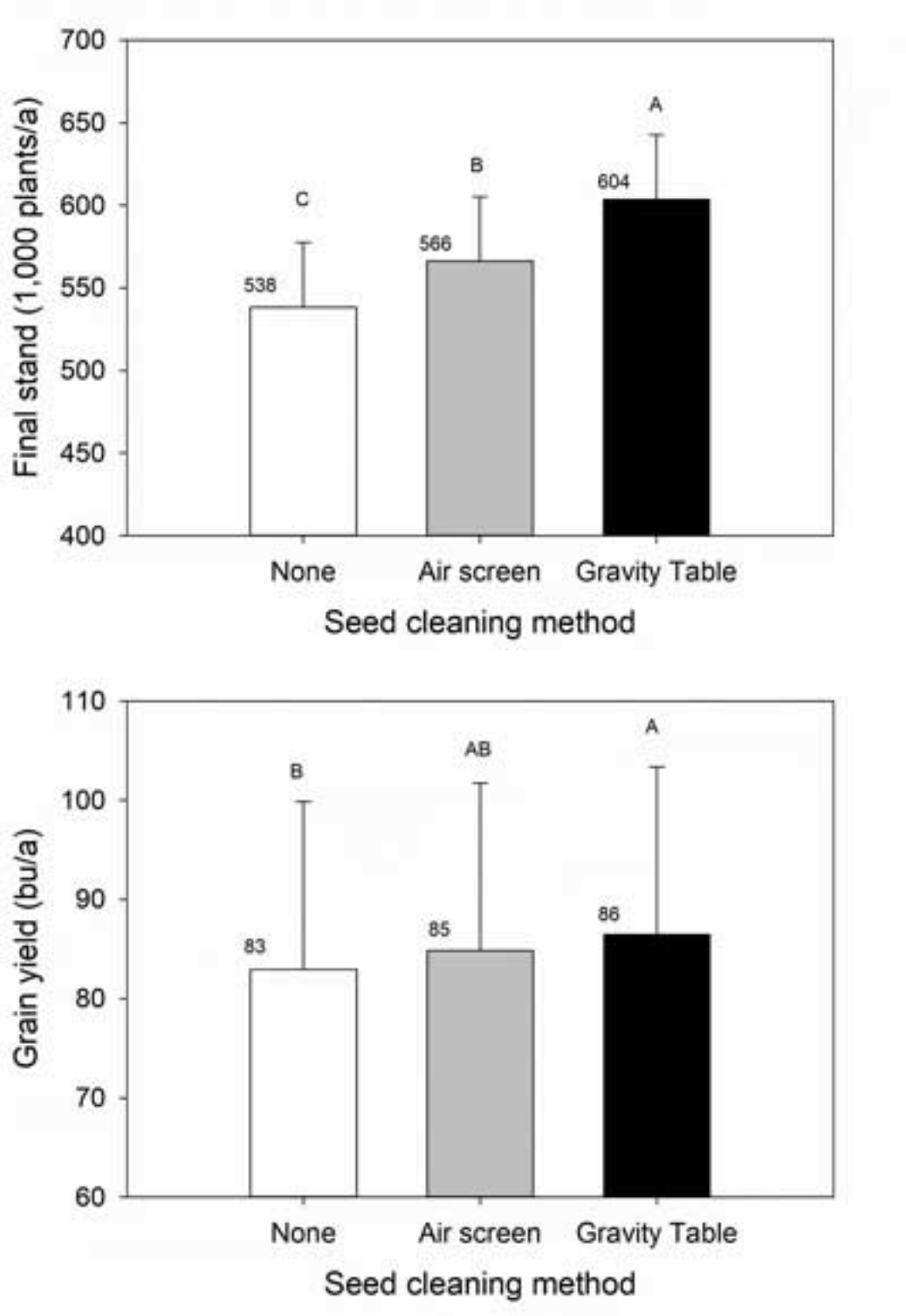


Figure 2. Effects of seed cleaning method on wheat stand establishment (upper panel) and grain yield (lower panel). Data summarizes a study conducted in seven locations (Ashland Bottoms, Belleville, Colby, Hutchinson, Leoti, Manhattan, and Mitchell) during the 2018-19 growing season. Graphs by Romulo Lollato, K-State Research and Extension.

Seed with test weight slightly lower than 57 lbs/bu may be acceptable to sow next year's crop (if

necessary), but when the low test weight is caused by Fusarium, the percent germination of the cleaned wheat seed might be well below acceptable levels despite acceptable test weights. In these cases, a fungicide seed treatment can help improve germination.

Producers will want to take certain steps when sowing the next wheat crop to help increase the chances of getting a good stand. Low-test-weight seed usually germinates well, but seedlings tend to have lower vigor than seedlings from seed with higher test weights. Therefore, producers should take special care to try to get a good, uniform stand.

Drill speed. Using a drill speed of 5 mph or less will help ensure that the seed is placed down in the seed slot, and that the seed slice is closed and firmed properly, making for good seed-soil contact. Getting good seed-soil contact will help the seedlings develop a good primary and secondary root system. Also, when drill speeds are too fast, the openers tend to "ride up" at times, resulting in a planting depth that is shallower than intended.

Seeding depth. All wheat should be planted at the proper depth for best stands. But it is especially important that low-test-weight seed is not planted too deeply, since this seed has low emergence vigor to start the growing season. It is equally important not to plant too shallowly. Shallow-planted wheat often has more difficulty establishing a good root system in the fall than wheat planted at the proper depth, and this can be an even greater problem when using low-test-weight seed. Plant low-test-weight seed 1 to no more than 1.5 inches deep.

Seeding rates. Usually, the lower the test weight, the more seeds there are per pound. Producers who use a planting rate based on pounds per acre should not adjust their seeding rate when planting low-test-weight seed. They will end up planting more seeds per acre, but emergence is often somewhat lower with low-test-weight seed, so the stand should come out about normal. If the cause of low test weight includes fungal diseases such as *Fusarium* head scab, which decrease wheat germination rate, an increase in seeding rate may ensure a good and uniform stand.

Seed treatments. Fungicide seed treatments may improve germination or seedling vigor of low-test-weight seed, and protect against certain diseases. See the accompanying article in this issue of the eUpdate for more information.

Seed cleaning. Producers should make every effort to have their seed cleaned as thoroughly as possible to remove scabby kernels and shriveled seed. This may help increase the test weight and improve emergence and seedling vigor (Figure 2). Adjusting the settings during seed cleaning to blow lighter seed away can add 1 to 2 pounds to the seed lot's test weight by removing the small kernels. However, if the majority of the kernels are lighter and shriveled, the potential of gaining much test weight is limited, or the cleanout percentage is high.

Germination testing. This year, it would desirable to have the seed germination evaluated by a seed-testing lab to ensure a proper stand. The turnaround time for this type of testing is generally 7 to 14 days once the seed-testing lab receives the sample. The variation in the turnaround time depends on the need for pre-chilling treatment prior to the germination test. The need for pre-chilling typically ends around Labor Day weekend. The cost of testing at the Kansas Crop Improvement Association (KCIA) is $17.00 for the standard warm germination test. Growers or others can contact KCIA by phone at 785 532-6118, or by email at kscrop@kansas.net.

On-farm germination tests may be an option for growers who do not have time to have seed

evaluated by a seed-testing lab. This topic is addressed in an accompanying article in this eUpdate issue.

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu

Erick De Wolf, Extension Plant Pathology
dewolf1@ksu.edu

Eric Fabrizius, Seed Laboratory Manager, Kansas Crop Improvement Association
efkcia@ksu.edu

2. Make an informed decision when selecting the best wheat variety

In recent years, wheat producers are faced with an increasing number of varieties from which to choose. One of the reasons behind having so many available varieties is that many public and private institutions are breeding wheat varieties in the Great Plains: Colorado State University, Kansas State University, Oklahoma State University, Texas A&M University, University of Nebraska, AgriPro/Syngenta, Limagrain, and WestBred/Monsanto. Additionally, several companies license varieties from existing breeding programs, such as AGSECO, Dyna-Gro, AgriMaxx among others.

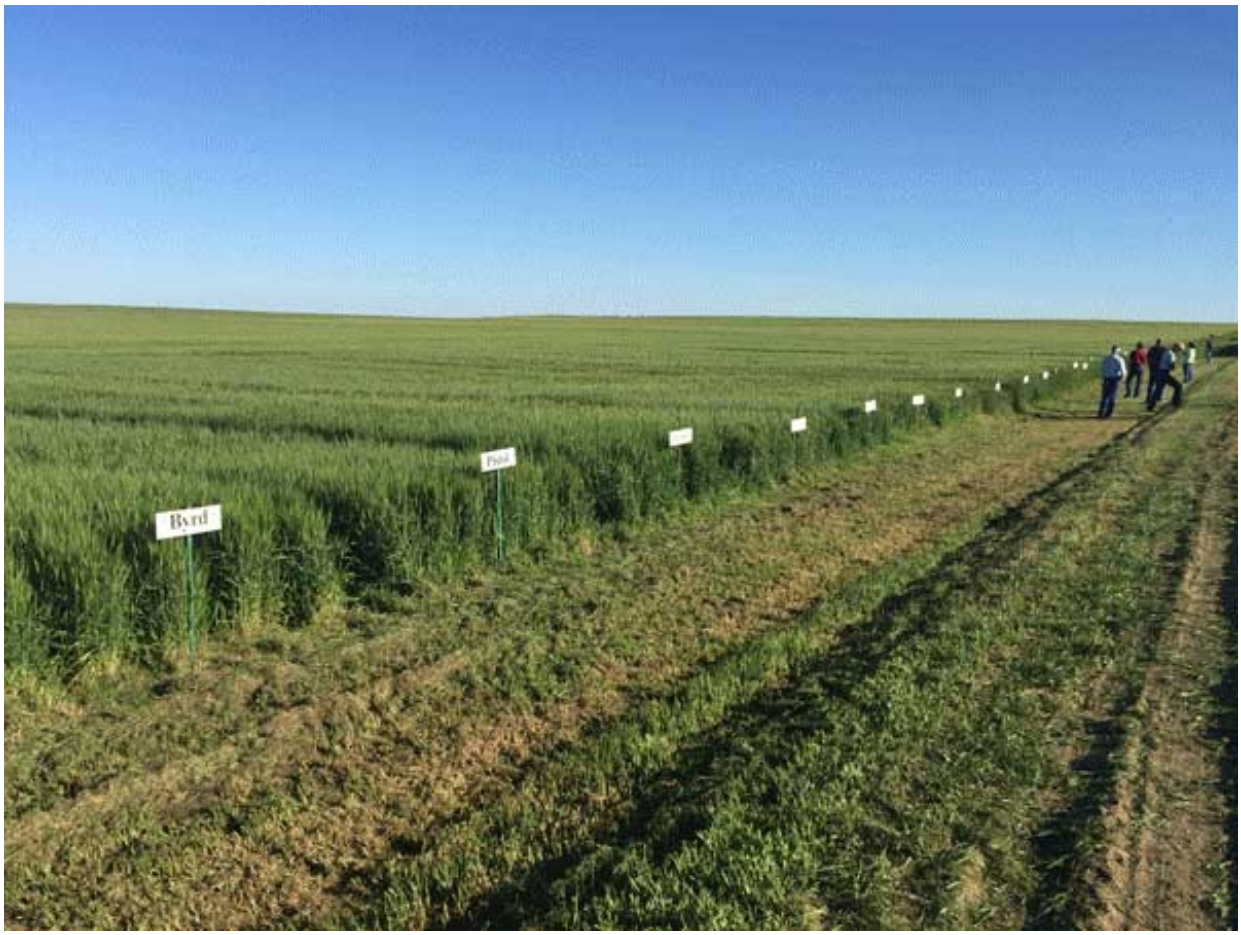


Figure 1. Producers in Kansas have many wheat varieties to evaluate. Photo by Romulo Lollato, K-State Research and Extension.

Producers can use different tools and publications to study each variety's strengths and weaknesses, selecting varieties that best match their needs.

Making a better decision: Steps to select a wheat variety

The following information provides a step-by-step guideline, as well as relevant resources, to help producers make a better decision when selecting one or a few varieties to plant in their operation.

1. **Select several varieties that are adapted to your region of the state.**

Regardless whether you intend to plant one variety or several on your farm, it is important to start out with a list of several good candidate varieties. The final product of interest is grain yield and therefore, it is crucial to select varieties that have shown consistent performance and excellent yield record in the region. Varieties that worked well for you and your neighbors in the past should be considered, but also make sure and check yield results from nearby K-State (and other universities') variety performance tests and demonstration plots. It is important to take into consideration the conditions experience during the year in question. For instance, results from central Kansas during 2019 season were extremely variable due to excessive rainfall at several locations. Thus, when looking at these results is very important that results from more than a single year, and possibly more than a single nearby location, are taken into consideration.

A few great resources to consult are:

a. K-State variety performance test: Start searching by year, narrow down your search by region and finally by site. Choose the site(s) nearest to you and look for varieties that are consistently toward the top. Repeat the procedure for different years to check the consistency of the variety performance. Click the link above to access the K-State variety performance test results.
b. OSU variety performance tests: If you are in southern Kansas or in Oklahoma, this is also an excellent resource. Click "Variety Testing" in the link above and then "Grain Yield" to have access to similar information to the one offered by K-State, but for variety performance tests from Oklahoma. Follow the steps described above. Click the link above to access the OSU variety performance test results.
c. Colorado Wheat Variety Database: This database encompasses replicated trial results from Colorado, Kansas, Oklahoma, and several other public state trials, so producers throughout the Plains can benefit. It is an excellent, easy-to-use resource that allows you to dig into data from single location, multiple locations, multiple years, and also allows for head-to-head variety comparisons. We suggest that users start by looking at "Single Location Trial Data", selecting the location nearest to you, and repeating this step for several years of data for that location. Check for varieties that tend to be consistently toward the top. Afterwards, look at "Multiple Location Trial Data," which will allow you to look at yields spanning a wider geographical region instead of a single location for one, two, three, or four years combined. Depending on region and number of years selected, you might be looking at more than 15 replicated trials combined. Thus, if a given variety remains a top yielding variety across all these replicated trials, it is a pretty good argument that you should at least look at that variety's characteristics and consider it in your farming operation. Finally, after selecting a few potential candidates based on their performance, we suggest that users click on "Head-to-head comparisons", so they can test whether those candidates performed statistically different over a wide range of environments. Click the link above to access the Colorado database.

2. **Narrow down the number of varieties in your list to a few solid candidates.**

After selecting several varieties that have shown good adaptability and stability in your region, the list needs to be narrowed down to the number of varieties you intend to plant. Ideally, at least two or

three varieties (or a blend of two or three varieties) should be planted to spread the risk on your acres. Select varieties that are adapted and resistant/tolerant to the major concerns in your operation, but that have contrasting characteristics such as different maturities or disease resistance characteristics. This will help buffer the risk of a single event compromising production of the whole operation. Some factors to consider include:

a. *Production system:* For producers who graze their wheat before taking it for grain (dual-purpose producers), selecting a variety with good forage yield, medium to late first hollow stem, Hessian fly, barley yellow dwarf, and wheat streak mosaic resistance; and good recovery from grazing is very important. Another consideration is whether the crop will be irrigated or dryland. Wheat varieties differ in their straw strength. There are a few varieties that should be restricted to dryland use, due to their below-average straw strength. A history of feral rye in the field would suggest the need for a Clearfield variety and this plays an important role in variety selection. Double-cropping wheat following soybeans may require varieties with excellent tillering potential and possibly early- to medium-early maturity to compensate for the delayed development due to late planting. No-till producers in western Kansas might be looking for tall varieties with good straw production potential to help improve water retention in the soil, so this could also play a role in selecting a variety.
b. *Tolerance to abiotic factors:* Depending on the region of the state where your farm is located, it will be subjected to different abiotic stresses. Acid soils are a major concern in south central, central, and north central Kansas, and varieties that have good low soil pH tolerance are warranted. Meanwhile, drought is a dominant factor in western Kansas, and varieties with better drought tolerance should be favored there. Varieties differ in their tolerance to abiotic stresses, and selecting a variety with better tolerance to the major limiting factor in your operation will allow the variety's potential to be more easily achieved.
c. *Disease resistance:* Variety selection can help reduce the risk to many of the most common and damaging diseases in Kansas. Selecting varieties with good stripe rust and leaf rust resistances can reduce the risk of severe disease problems and the need for foliar fungicide in the spring. However, due to a potential race change for both stripe and leaf rusts in 2019, producers are encouraged to scout their fields even if the selected varieties were rated as resistant in the past. Producers who are willing to spray a foliar fungicide have more variety options to choose from than those who are not. Some varieties have many very good characteristics and yield potential, but lack resistance to some major fungal diseases and thus require a fungicide to maintain their productivity. For example, Everest has many good characteristics, such as intermediate head scab resistance, some of the best barley yellow dwarf resistance available, and acid soil and Hessian fly tolerance; however, it is very susceptible to stripe rust. If a producer is willing to spray a foliar fungicide, Everest is still a good option. This is also true for varieties such as Avery, Denali, WB Grainfield, etc. Diseases such as leaf or stripe rust can be controlled with a foliar fungicide and producers have the option to budget for it in their operation. Meanwhile, other diseases require more of a systems management approach and cannot be controlled after they are established. These include viral diseases such as wheat streak mosaic and barley yellow dwarf, and can also include a fungal disease such as Fusarium head blight, which is not always successfully controlled with fungicide spraying. If these diseases are common concerns in your region, evaluate each variety's ratings against these constraints and selecting the ones that provide better levels of resistance.
d. *Maturity:* Selecting several varieties with differing maturities is a great tool to spread risk as well as to optimize harvest timing. You don't want to have too many acres ready for harvest at once and then have to wait for harvest for lack of combine capacity. Early-maturing

varieties will most likely have a yield advantage over later-maturing varieties in years such as 2012 and 2018 when the grain filling period turns hot and dry. Also, from a historical perspective, early-maturing varieties have been more successful in the southern portion of the state, especially south central Kansas, due to the typical hot weather pattern toward the end of the growing season. On the other hand, medium-late maturing varieties will benefit from growing seasons with an extended grain-filling period, such as 2015, 2016, and 2017. It is important to keep in mind that recent years favored later-maturing varieties throughout the state. If we only look at the most recent years it will be tempting to plant later-maturing varieties, even in south central Kansas. However, nothing guarantees that the next growing season will be similar. At sowing time, we don't know how the weather will turn out during grain fill. Therefore, spreading the risk in your operation by selecting varieties with differing maturities is always a good idea. In other words, you can plant a medium or medium-late maturing variety in south central Kansas, but keep it to a fraction of your acres.

Resources

A few great resources to help you walk through each variety's characteristics as far as maturity, disease ratings, drought and soil pH tolerance, date of first hollow stem, and other agronomic characteristics are:

a. K-State Wheat Variety Disease and Insect Ratings 2019*:* This comprehensive guide to wheat varieties will allow you to compare different varieties in their agronomic and disease resistance characteristics in detail. Many varieties are individually described, others are shown in a table format which allows for easy and fast comparison. It is available online at the link above or in your county Extension office in Kansas.

b. *Wheat Varieties for Kansas and the Great Plains by Layton Ehmke*: This private-sector book is also an excellent, comprehensive source of information regarding different varieties and their characteristics. It provides detailed ranking of varieties by traits of interest, making it easy to use. It also has a good summary of several variety performance tests in the Great Plains. While not available online, producers can purchase it in the link above if interested.

c. *K-State Wheat Variety Date of First Hollow Stem and Grain Yield 2018-2019*: This new K-State publication compare several varieties in their fall forage production, date of first hollow stem, and grain yield under dual-purpose versus grain-only management in south central Kansas. It is a good resource for producers who graze their wheat before taking it for yield. It is available online at the link above or in your county Extension office in Kansas.

d. OSU Fall forage production and date of first hollow stem in winter wheat varieties during the 2017-2018 crop year: similarly to the publication above, this OSU publication compares varieties' forage yield and date of first hollow stem for north central and central Oklahoma. Available online at the link above or in your county Extension office in Oklahoma.

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu

Erick DeWolf, Extension Plant Pathologist
dewolf1@ksu.edu

3. Volunteer wheat control: Protecting Kansas wheat

Wheat in the Great Plains is often plagued by complex of viral diseases including wheat streak mosaic virus, High Plains virus, and Triticum mosaic virus. As we move toward planting season, it is helpful to have a few timely reminders about ways to reduce the risk of disease problems in 2020.

What measures can producers take to prevent outbreaks of viral diseases in wheat this coming season?

There are several things producers can do: delay planting dates as long as feasible, control any significant stands of green foxtail and barnyard grass near fields that will be planted to wheat, and plant wheat varieties with resistance to wheat streak mosaic virus (Joe or Oakley CL) or to the wheat curl mite (Byrd, Langin, TAM 112, T-158, etc.). However, getting good control of these virus diseases starts primarily with controlling volunteer wheat, especially after the recent rainfall events. Control volunteer wheat **soon** in order to protect the wheat crop planted this fall.

Volunteer wheat within a mile or more of a field that will be planted to wheat should be completely dead **at least two weeks before wheat planting**. This will also help control wheat curl mites, Hessian fly, and wheat aphids (bird cherry oat aphids and greenbugs, etc.) in the fall.

Wheat streak mosaic virus

The most important threat from volunteer wheat for wheat producers in the western half of the state is the wheat streak mosaic complex including *wheat streak mosaic*, *High Plains mosaic*, and *Triticum mosaic*. These diseases cause stunting and yellow streaking on the leaves (Figure 1). In most cases, infection can be traced to a nearby field of volunteer wheat, although there are other hosts, such as corn, millet, and many annual grasses, such as yellow foxtail and prairie cupgrass. Controlling volunteer is one of the most effective way to lower the local risk of the wheat streak mosaic virus complex.

Figure 1. Wheat streak mosaic. Photo by Erick DeWolf, K-State Research and Extension.

Wheat streak mosaic virus is carried from volunteer wheat to newly-planted wheat by the wheat curl mite. These tiny, white, cigar-shaped mites are too small to be seen with the naked eye. The curl mite is carried by wind to new hosts and can travel more than a mile from volunteer wheat. The wheat curl mite also carries the High Plains virus and triticum mosaic virus. When mite populations are large, the wheat curl mites can cause curling of leaf margins and head trapping.

Wheat streak mosaic can cause severe economic damage. Wheat curl mites, and thus wheat streak mosaic, are problematic in the western half of Kansas. Figures 2 and 3 show yield maps from Meade and Wichita Counties, respectively (courtesy of Ediger Seeds and Horton Seed Services), in which one edge of the field had a severe outbreak of wheat streak mosaic virus because volunteer wheat was left uncontrolled in a neighboring field. On Figure 2 (2015-16 growing season), the average yield in the entire section was approximately 54 bushels per acre and some portions of the field yielded as much as 77 bushels per acre; still, the area where wheat streak mosaic was more severe yielded less than 18 bushels per acre. On Figure 3 (2016-17 growing season), the entire field was affected by wheat streak mosaic virus and the field average was close to 25 bushels per acre. While spots where the disease incidence was lower yielded over 40 bushels per acre, the entire southwest corner and west border near the neighboring field hosting the volunteer wheat yielded less than 5 bushels per acre.

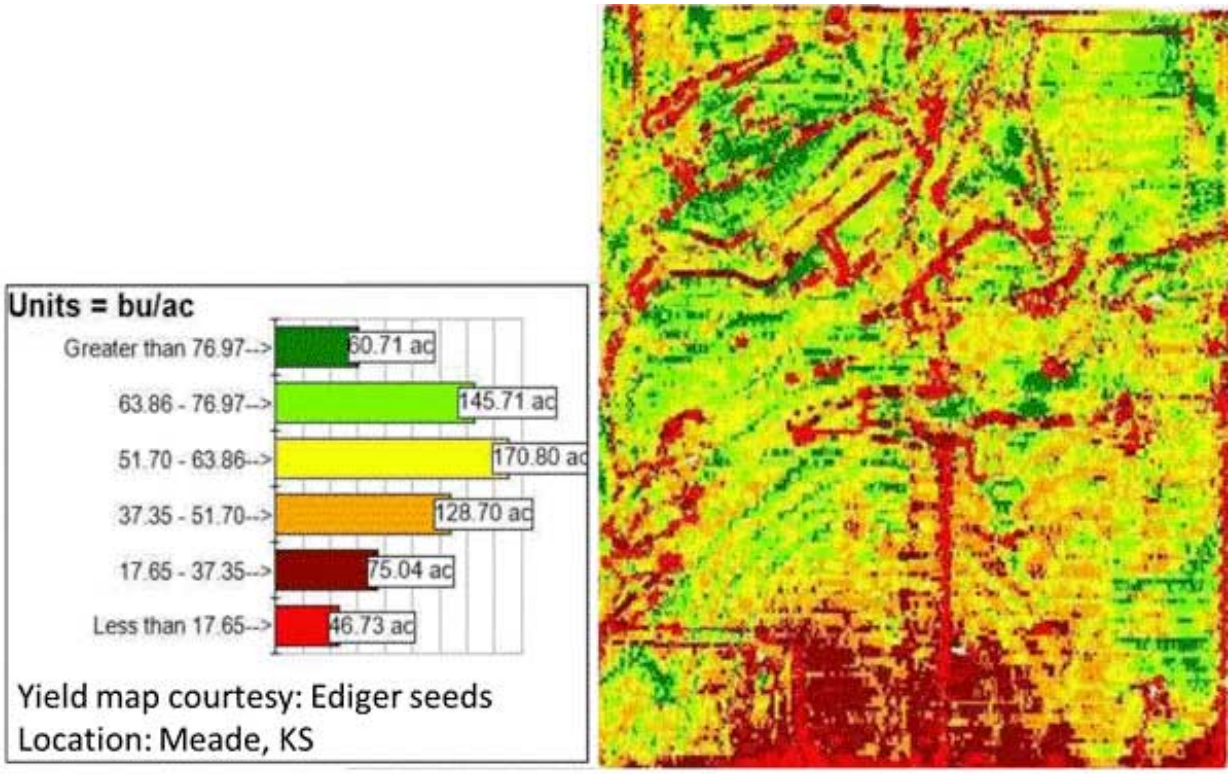


Figure 2. Yield map showing the magnitude of yield loss in a field where the south border was infected with wheat streak mosaic virus. The mean yield of the field was 54 bushels per acre whereas the affected area yielded less than 18 bushels per acre. Yield map courtesy of Tyler and Darwin Ediger, Meade, Kansas. 2015-16 harvest.

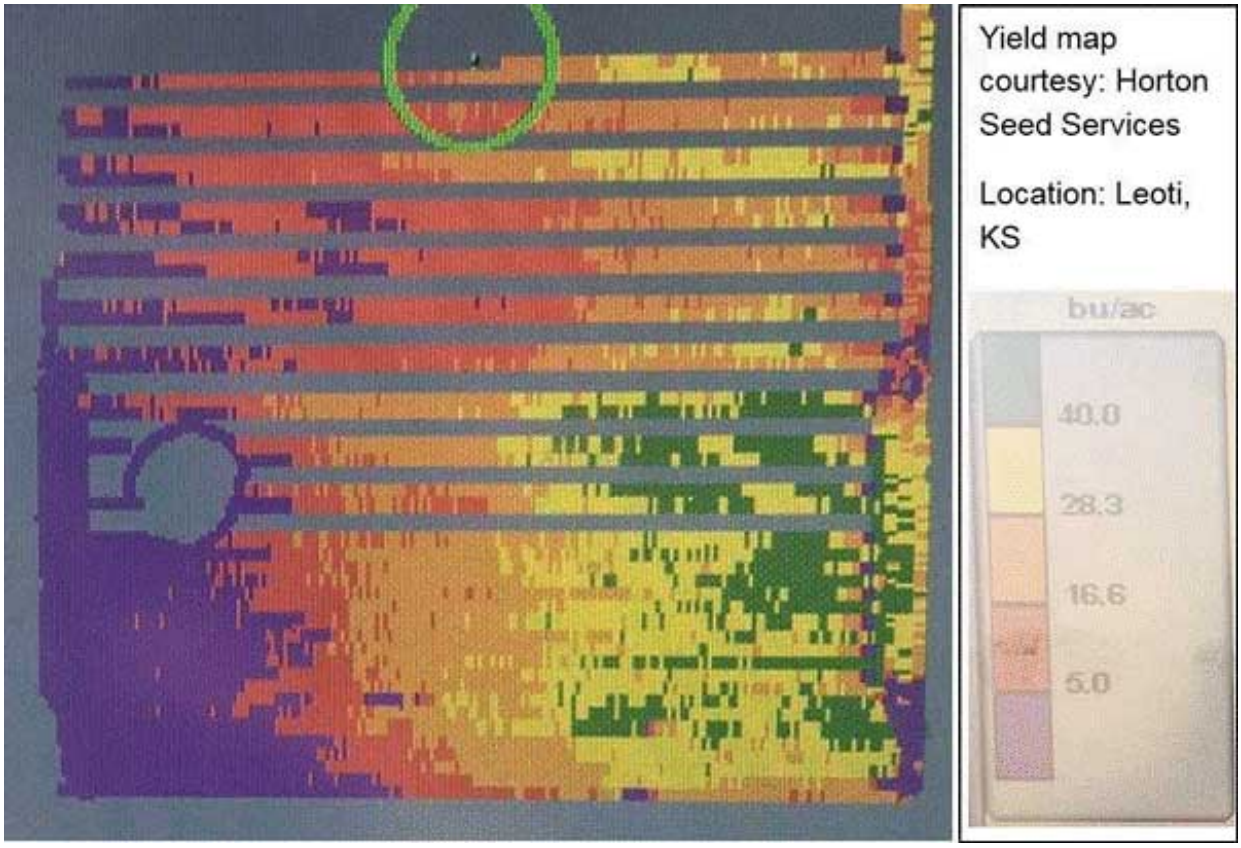


Figure 3. Yield map showing the magnitude of yield loss in a field where the entire field was infected with wheat streak mosaic virus, and the west border was zeroed out. The mean yield of the field was approximately 25 bushels per acre whereas the affected area yielded less than 5 bushels per acre. Yield map courtesy of Rick and Alec Horton, Leoti, from the 2016-17 harvest.

Hessian fly

Hessian flies survive over the summer on wheat stubble. When the adults emerge, they can infest any volunteer wheat that may be present, which will keep the Hessian fly population alive and going through the upcoming crop season. We have found that Hessian flies have an adult emergence "flush" after moisture events all summer and even into November, depending upon temperatures. Therefore, it seems it is really more of a continuous potential for infestation, making it even more critical to destroy volunteer in a timely manner. If there is no volunteer around when these adults emerge, they will not be able to oviposit on a suitable host plant. If the volunteer is destroyed while the flies are still larvae, this will help to reduce potential problems.

Hessian flies can be problematic all across Kansas, varying in different locations and years depending upon weather conditions and the amount of volunteer wheat. Hessian fly larvae attack young wheat plants near the soil line. Tillers may be stunted and later may lodge. In heavy infestations, the whole stand may be lost.

Barley yellow dwarf virus

Volunteer wheat is a host of barley yellow dwarf virus, and the greenbugs and bird cherry oat aphids that carry it. So in that respect, destroying volunteer helps reduce the reservoir for the barley yellow dwarf viruses. The aphids have to pick up the BYD virus from an infected host plant first in order to become a carrier that can transmit the disease to wheat. Host plants that can carry the disease include volunteer wheat, corn, and others. However, destroying volunteer will have little effect on aphid populations in the fall and spring since the aphids migrate into the state from southern areas.

Russian wheat aphids may also live over the summer on volunteer wheat. While this insect has wings and can be wind borne for hundreds of miles, the vast majority of fall infestations in Kansas appear to originate from nearby infested volunteer.

Various other pests

A number of other pests are also associated with the presence of volunteer wheat. An example in western Kansas is the Banks grass mite. During some years, infestations become established during late summer and early fall on volunteer wheat. Later, as the quality of the volunteer deteriorates, mites move from the volunteer into adjacent fields of planted wheat or other small grains. Occasionally mites will survive the winter and continue to spread into the planted wheat following green-up in the spring.

A concern in the eastern part of the state is the chinch bug. Occasionally, adult bugs will fly from maturing sorghum fields in late summer to nearby fields where volunteer wheat is growing. Where infested volunteer is allowed to grow right up until seedbed preparation just prior to planting, early-planted continuous wheat is likely to become infested. Similarly, volunteer that is allowed to grow through the fall and into the following spring may serve as an attractive chinch bug host.

Another reason to control volunteer is that volunteer and other weeds use up large amounts of soil moisture.

Control options for volunteer wheat

Destroying volunteer after the new wheat emerges is too late. Producers should leave enough time to have a second chance if control is incomplete. Tillage and herbicides are the two options available for volunteer wheat control.

Tillage usually works best when plants are small and conditions are relatively dry. Herbicide options depend on cropping systems and rotations. Glyphosate can be used to control emerged volunteer wheat and other weeds during the fallow period in any cropping system. However, it has no residual activity and will not control later germinating volunteer wheat or weeds.

If glyphosate is used too close to planting time, volunteer may stay green long enough to transmit diseases and insects to the new crop. It may take as long as one week following glyphosate application before the wheat will die, so that needs to be considered when timing the application to break the bridge for insects and diseases. The optimum time to treat with glyphosate is when most of the volunteer has emerged and is healthy and actively growing. Glyphosate can effectively control volunteer wheat that has tillered.

Atrazine is a relatively inexpensive treatment for volunteer wheat control that can be applied anytime in the summer or fall, if rotating to sorghum or corn. In the September to October time

period, using atrazine plus crop oil alone can often control small volunteer wheat that has not yet tillered, as well as later-emerging volunteer wheat and other weeds.

If the volunteer has tillered, most of the roots will have grown deep enough to be out of the reach of atrazine. This is when it helps to add glyphosate to the atrazine plus crop oil. Glyphosate is translocated from the leaf tissue throughout the plant. The combination of glyphosate and atrazine will provide a good combination of burndown and residual control on both volunteer that has tillered and later-emerging volunteer. Atrazine rates need to be adjusted to soil type and pH, and may not be appropriate for all areas.

Paraquat use in wheat stubble has increased as an alternative to control glyphosate resistant Palmer amaranth and kochia. Paraquat also can control small volunteer wheat if good spray coverage is achieved, but is less effective than glyphosate for control of volunteer wheat, especially if plants have started to tiller. It may be tempting to tank-mix paraquat and glyphosate together to get broader spectrum weed control. Unfortunately, the two herbicides are antagonistic when combined together, often resulting a dramatic reduction in volunteer wheat and grass control when applied as a tank-mix. Applying the glyphosate 24 hr in advance of paraquat can avoid the antagonism. Where it fits in the rotation, tank-mixing atrazine with paraquat generally results in enhanced volunteer wheat control compared to paraquat alone.

In summary, the most important reasons to control volunteer wheat are:

- Wheat curl mite/wheat streak mosaic virus
- Hessian fly
- Russian wheat aphid
- Take-all
- Bird cherry oat aphid/greenbug/barley yellow dwarf virus
- Banks grass mite
- Chinch bug
- Reduces moisture loss

Additional resources from K-State Research and Extension

"Wheat Streak Mosaic", MF3383: https://www.bookstore.ksre.ksu.edu/pubs/MF3383.pdf

"Triticum Mosaic", EP145: https://www.bookstore.ksre.ksu.edu/pubs/EP145.pdf

"Wheat Variety Disease and Insect Ratings 2019, MF991:
https://www.bookstore.ksre.ksu.edu/pubs/MF991.pdf

Erick DeWolf, Extension Plant Pathologist
dewolf1@ksu.edu

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu

Dallas Peterson, Weed Management Specialist
dpeterso@ksu.edu

Jeff Whitworth, Extension Entomologist
jwhitwor@ksu.edu

4. Control seed-borne diseases in wheat with fungicide seed treatments

Fungicide seed treatments are becoming an important part of wheat production in Kansas. In 2019, Fusarium is an important issue for many seed producers. The seed-borne Fusarium often reduces germination and seedling vigor, which frequently translates into poor stand establishment. If growers suspect a seed lot may be affected by Fusarium, they should plan to clean the seed to remove the most severely damaged kernels, apply a fungicide seed treatment, and check the germination to help ensure seed quality.

Figure 1. Fusarium head blight wheat. Photo by Erick DeWolf, K-State Research and Extension

Other benefits of seed treatments

Although Fusarium is the major problem in 2019, there are additional reasons to consider fungicide seed treatments. The paragraphs below highlight some of the potential benefits:

Fungicide seed treatments help keep seed-borne diseases such as smuts and bunts in check. Loose smut control requires a systemic fungicide like tebuconazole or difenoconazole. Common bunt, sometimes called, "stinking smut", can be controlled very effectively with most commercial treatments. Some regions of the state have struggled with these diseases in recent years. If you are planning to keep seed that is known to have or been exposed to common bunt, it is critical to use a fungicide seed treatment to avoid problems in the future.

Seed production fields are a top priority for fungicide seed treatments. These fields have a high value and investments in seed treatments here help prevent the introduction and development of seed borne diseases on your farm. Due to the high value of the seed produced, even small yield increases can justify the use of seed treatments.

Seed treatments can aid stand establishment when planting wheat after soybean harvest, even on seed that has high test weight and good germination. Planting wheat late into cool, wet soils often delays emergence, and reduces the tillering capacity of wheat seedlings. This reduced tillering capacity diminishes the plants ability to compensate for stand loss and maintain yield potential.

Some fungicide seed treatments also suppress the fall development of foliar diseases. For example, treatments containing tebuconazole and difenoconazole provide some protection against fall infections of powdery mildew, leaf rust, and Stagonospora nodorum leaf blotch. A seed treatment will not prevent the disease from becoming reestablished in the spring, and foliar fungicide applications may still be required to protect yield potential of the crop.

Things to remember

As with most things in agriculture, producers must balance the possible benefits against the cost. Some growers also prefer not to risk having leftover treated seed to deal with at the end of planting. However, this issue can be avoided by using hopper box treatments or other on-farm application equipment in some cases. If seed is treated on-farm, pay close attention to thorough coverage of the seed. Incomplete coverage can reduce the efficacy for the seed treatment.

There are many different seed treatments available for wheat. Although most seed treatment ingredients are fungicides, some will also contain insecticides. Each ingredient targets slightly different spectrum of disease causing fungi or insect pests. Therefore, many commercial formulations include combinations of ingredients that provide a broader spectrum of protection.

For more information, see K-State publication MF2955, *Seed Treatment Fungicide Wheat Disease Management 2017* at: http://www.ksre.ksu.edu/bookstore/pubs/MF2955.pdf

Erick DeWolf, Extension Plant Pathology
dewolf1@ksu.edu

Romulo Lollato, Extension Wheat Specialist
lollato@ksu.edu

5. Check terraces now for needed repairs and maintenance

Mid-summer is a good time to evaluate and perform maintenance on terraces if fields are in wheat stubble. In Kansas, over 9 million acres of land is protected by more than 290,000 miles of terraces, making Kansas #2 in the U.S. for this soil and water conservation practice. To accomplish the goal of erosion control and water savings, terraces must have adequate capacity, ridge height, and channel width.

Without adequate capacity to carry water, terraces will be overtopped by runoff in a heavy storm. Overtopping causes erosion of the terrace ridge, terrace back slope, and lower terraces and may result in severe gullies. Terraces are typically designed to handle runoff from a 1-in-10-year storm. The rainfall amounts for such a storm are approximately five inches for eastern Kansas, four inches for central, and three inches for western Kansas during a 24-hour period. Kansas producers have seen their fair share of these intense storms in the spring and summer of 2019.

Terraces need regular maintenance to function for a long life. Erosion by water, wind, and tillage wears the ridge down and deposits sediment in the channel, decreasing the effective ridge height, and channel capacity. The amount of capacity loss depends on the type and number of tillage operations, topography, soil properties, crop residue, and precipitation. Terrace maintenance restores capacity by removing sediment from the channel and rebuilding ridge height.

Typically, more frequent maintenance is required for steep slopes and/or highly erodible soils. Annual maintenance is necessary for intense tillage operations and heavy rainfall runoff. Less frequent maintenance is often adequate with high residue levels or where lower rainfall occurs and runoff intensity is low.

Check for needed repairs

Terraces degrade naturally by erosion and sediment, and can be damaged by machinery, animals, settling, and erosion. Check terraces and terrace outlets regularly (at least annually) for needed repairs. The best time to check is after rains, when erosion, sedimentation, and unevenness in elevation are easiest to spot. Specific items to note are overtopping, low or narrow terrace ridges, water ponding in the channel, terrace outlets, erosion, and sediment clogging near waterway or pipe outlets.

Reshaping the terrace

Terrace maintenance can be done with virtually any equipment that efficiently moves soil. Common tools include those that turn soil laterally, such as a moldboard plow, disk plow, one-way, terracing blade (pull-type grader), or 3-point ridging disk (terracing disk, etc.); those that convey or throw soil (belt terracer, scraper, whirlwind terracer, etc.); and those that push or drag soil (dozer blade, straight-wheeled blade, 3-point blade, etc.).

This article discusses procedures for the common plow. For other equipment, get advice from manufacturers, other users (contractor), or experiment to find what works best.

The primary objective in reshaping the terrace is to move soil from the channel to the ridge. Work

done on the terrace back slope or cut slope above the channel may help maintain or improve shape but does little to add significant ridge height or channel capacity. Because of improved efficiency, a two-way (rollover) plow is ideal for terrace maintenance. It can usually achieve the desired shape with fewer passes than the conventional plow. Turn the soil in one direction to counteract erosion or turn it in either direction to clear the channel or raise and widen the terrace ridge.

The number of passes required for maintenance depends on the size of the tool, the depth of operation, travel speed (which controls distance of throw), and the amount of soil moved. The plow throws soil further at higher speeds, so a minimum ground speed of 5 mph in loose soil is suggested, but 6 mph or more is better.

Maintenance controls terrace shape. Assess what needs to be done before beginning maintenance. Compare the existing cross-section shape with the desired shape and size, and determine where soil should be removed and where it should be placed for the desired result. Back furrows are placed where more soil is needed, while dead furrows are located where soil needs to be removed. In this way, passes or sets of passes with the equipment are located to achieve the desired results.

Terrace dimensions can be changed by carefully planned placement of back furrows and dead furrows. Large changes in dimension and shape require several sets of passes with the tools or earthmoving equipment. Plan the terrace cross-section shape and size and terrace slope segment length to fit current and future tillage, planting, and harvesting equipment size.

The number of rounds or passes with maintenance equipment depends on the beginning shape of the terrace, size of equipment, and the desired size and shape. If in doubt, make more passes rather than stop too soon. Remember, the loose soil will settle a lot.

Plowing the ridge. The terrace ridge is raised and widened by plowing up from both sides as shown in Figure 1. When a 2-way plow is used, plow just the front slope from the channel to the ridge. Plowing the backslope makes it steeper.

Figure 1. Double back furrow. Arrow indicates the back furrows meeting on the top of the ridge. Image from K-State Research and Extension.

The back furrows are placed on top of the ridge, and the dead furrows are placed at the desired center of the channel and at the toe or beyond on the backslope. Avoid making a depression on the backslope by varying where the dead furrow is placed. Plowing the ridge is recommended for

maintaining or adding ridge height. To make the ridge wider and not so sharply peaked, the back furrows should come together, but not overlap and make additional rounds. Correct a narrow peaked ridge resulting from too few passes by moving the plow over only one or two bottom widths with each pass. This process requires many more rounds.

To make the terraces slopes long enough to fit equipment, always leave dead furrow the desired distance from the ridge. For the three-segment shape, locate the back and dead furrows in the same place each year, keeping the cross-section uniform in size and shape. Vary the back furrow and dead furrow locations each time to maintain the rounded shape of the channel and ridge for the large smooth section.

Plowing the channel. Sometimes even when the ridge is large enough, the channel can have inadequate capacity. To enlarge and widen the terrace channel, plow out to both sides as shown in Figure 2.

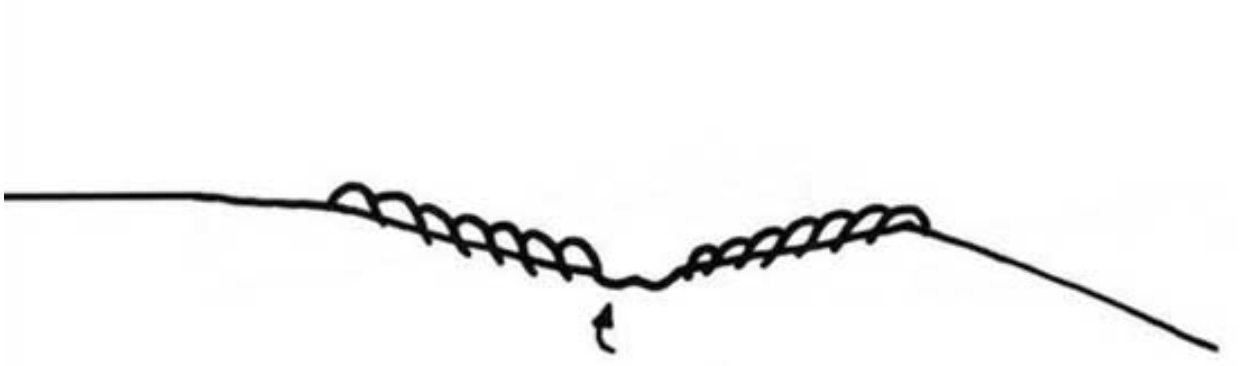


Figure 2. Enlarging and widening the terrace channel. Arrow indicates the two dead furrows meeting at the center of the channel. Image from K-State Research and Extension.

Back furrows are placed on the ridge and on the uphill cut-slope side the same distance from the desired center of the channel. Begin at a distance equal to that from ridge to desired channel center. A double side-by-side dead furrow should result at the desired channel center. Locate the plow back furrow on the ridge and the dead furrows in the desired channel bottom to achieve and maintain the desired shape. Vary the back furrow location to avoid leaving a large ridge on the cut slope.

Plowing out the channel periodically is recommended for steeper slopes to help maintain adequate channel capacity. Alternating between plowing the channel out and plowing the up from one time to the next is a good practice.

Consider conservation agriculture practices to increase terrace life

When silt bars and sediment deposits accumulate frequently in a terrace channel, excessive erosion is the cause. A change in tillage and cropping practices is needed to correct this cause. Adding cover crops to a system, switching to no-till or conservation tillage, and using crop rotations that retain crop residue will reduce erosion substantially. This will reduce the frequency of terrace maintenance needs. Many no-till producers find terrace systems require little maintenance. Although runoff still occurs, there is very little soil movement in a no-till system. Remember, terraces are there to help in extreme weather events, and terraces prevent gullies and are only a part of an overall erosion control plan. Conservation farming methods, especially retaining crop residue or using cover crops,

compliments erosion control structures and has been shown to be both economically and environmentally sound.

For more information, refer to publication Terrace Maintenance, C-709 available online at: http://www.ksre.ksu.edu/bookstore/pubs/C709.pdf

Another great resource is this KSRE YouTube video: Basics of Terrace Maintenance: http://youtu.be/CcolTeP9QRA

Additional sources for technical information include your local USDA-Natural Resources Conservation Service and County Conservation District offices.

DeAnn Presley, Soil Management Specialist
deann@ksu.edu

6. Planning your wheat fertility program: Start now by soil testing

Wheat planting is just a month or so away in parts of Kansas, so now is the time to get your soil sampling done to have good information on which to base your fertilizer inputs. This is particularly important since we continue to see very tight margins for wheat, and efficiency with focus on the most important variables in production will be critical.

Which nutrients should be tested?

The most important tests and nutrients to focus on this year depends in part on where you are located, the choices you make when applying N, and your tillage system. The nutrients for which wheat is most likely to show responses statewide are nitrogen (N) and phosphorus (P). Wheat is the most P-responsive crop we grow in Kansas, and while P removal with wheat may be less than with corn or soybeans, the relative yield response is often the highest. Therefore, knowledge of P soil test levels and fertilizer needs will be valuable. In addition, low soil pH is becoming a problem, especially fields with a history of high rates of N application and relatively low cation exchange capacity.

In addition to the "Big 3" (pH, N, and P), potassium (K) deficiency in wheat can also be found in some areas of southeast and south central Kansas. Wheat is generally less prone to K deficiency than many of the rotation crops commonly grown, such as corn, soybeans or grain sorghum. Generally, the focus of a K fertilization program is with the rotation crops, and meeting the higher K needs of corn and soybeans minimizes the chance of a K deficiency in wheat.

The 0-6 inch soil sample

A standard 0-6 inch surface sample is normally used to test for pH and the non-mobile nutrients such as P and K. Phosphorus and K are buffered processes in our Kansas soils. This simply means that the soil contains significant quantities of these nutrients, and the soil tests we commonly use provide an index value of the amounts available to the plant, not a true quantitative measure of the amounts present. In the case of P, most Kansas soils require about 18 pounds of P_2O_5 to increase 1 ppm in soil test P; for K is around 8 pounds K_2O to increase 1 ppm K soil test.

The buffering value for both P and K varies based on soil cation exchange capacity (CEC) and the soil test levels. On high CEC soils, especially those soils with high clay content, the buffering capacity goes up, so the soil test levels will change more slowly. However, on low CEC soils, the buffering capacity can be much lower, and soil test levels can change rapidly. The same situation occurs with soil test levels. On soils with low soil test P or K levels, it will require more P or K to raise the soil test than at high soil test levels.

In addition to requesting the standard soil tests of pH, P, and K from the 0-6 inch surface sample, producers might also want to monitor soil organic matter levels and micronutrients such as zinc (Zn). Zinc is not a nutrient commonly found deficient in wheat production. However, it is important for corn and grain sorghum. Thus including it in your sample package would be helpful for planning for these rotation crops.

Soil organic matter (SOM) is an important source of nutrients such as N and sulfur (S). When calculating the fertilizer needs for both these nutrients, SOM is taken into consideration. For wheat production, 10 pounds of available N and 2.5 pounds of S is credited for every 1% SOM in the soil.

The 0-24 inch soil sample

In addition to pH, SOM, P, K, and Zn -- all of which are non-mobile in soils and accumulate in the surface – the mobile nutrients N, S, and chloride can provide significant yield responses when deficient in soils. Since all three of these nutrients are mobile in soils and tend to accumulate in the subsoil, we strongly recommend the use of a 24-inch profile soil sample prior to growing wheat, corn, or grain sorghum.

Nitrogen is a nutrient likely to provide yield response statewide. One common misconception is that the accumulation of N in the soil profile only occurs in the drier, western half of the state. However, with our dry winters, N can accumulate in the soil statewide. Rainfall tends to peak in Kansas in June and July, with a rapid decrease in monthly precipitation in the fall. Rainfall totals are generally lowest in December and January. Wheat takes up the majority of its N prior to flowering. In southeast Kansas that is in April, and in north central Kansas it is in early May most years.

In many years, especially following dry summers, significant amounts of N can be present in soils at wheat planting. On the other hand, after good yields, the residual N levels may be lower than the commonly used “default” value, and N fertilizer rates would need to be adjusted accordingly.

Sulfur deficiency is increasing across the state in wheat production also. There are two primary causes: the reduction in sulfur deposition from the atmosphere seen over the past 2-3 decades, and the reduction in S content in many P fertilizers. While not as soluble as nitrate, S is also a relatively mobile nutrient which accumulates in the subsoil. The S profile soil test is a good way to determine S needs.

Chloride (Cl) is the third essential mobile element to be considered for wheat production with profile soil testing. Chloride deficiency is normally found in the eastern half of the state on soils that do not have a history of potash (KCl) application. In general, this includes many areas in eastern Kansas, north of the Kansas River, and the central corridor of wheat production. Chloride deficiency is associated with grass crops, wheat, corn, and grain sorghum, and is correlated with the plants ability to resist plant disease. Again, the profile soil test for chloride is well calibrated in Kansas and should be considered.

Summary

In summary, wheat producers in Kansas should consider soil testing to help in making accurate fertilizer decisions. Accurate decisions are especially important during years with low grain prices and tight budgets. Furthermore, after variable conditions and yield levels across the state, fertilizer needs may require adjustments based on soil test. Wheat producers specifically, should use surface 0-6 inch samples to determine the need for lime on low pH soils, P, K, Zn, and soil organic matter. They also should be using 24-inch profile soil tests for N, S, and Cl. Now is the time to get those samples taken, to ensure there will be enough time to consider those test results when planning your fall fertilizer programs.

Dorivar Ruiz Diaz, Nutrient Management Specialist
ruizdiaz@ksu.edu

7. Correlation of soil test nitrate level and wheat yield

Taking 24-inch soil profile-N samples in the fall has been a recommended practice for making an N recommendation for winter wheat for many years. However, due to the mobility of nitrate-N in the soil, soil test values observed in the fall may be different from values observed in the spring, particularly on soils prone to leaching. Because many producers wait until spring green-up to make their N application, **does soil sampling in the fall for nitrate-N really provide useful information for N management in wheat?** That is a legitimate question.

Analysis of yields taken from K-State research plots that received no N fertilizer shows a strong positive relationship with fall soil profile nitrate-N (Figure 1).

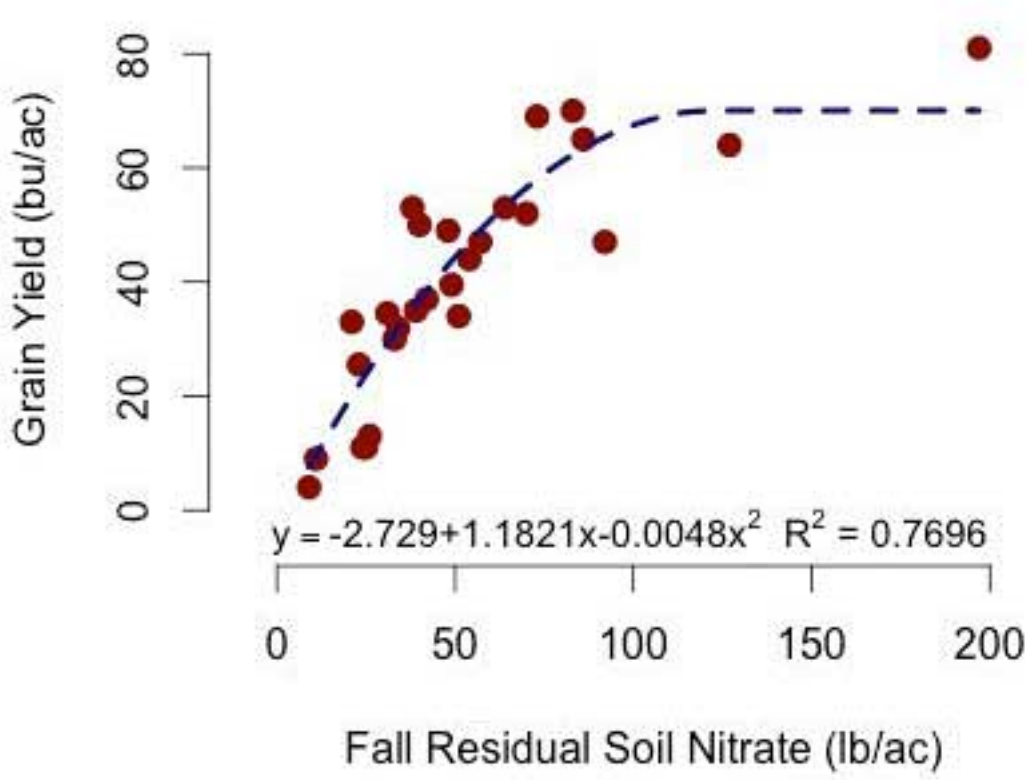


Figure 1. Relationship between fall soil profile nitrate-N level and wheat yield with no N fertilizer applied. Graph by Dorivar Ruiz Diaz, K-State Research and Extension.

We found that at low soil nitrate levels, wheat yields responded well to applied fertilizer. We also found that when fall soil profile nitrate-N levels are greater than 80 to 100 lb/acre, it is unlikely the site will respond to additional fertilizer N applied in the spring.

In short, a strong relationship was found between wheat yield and fall nitrate-N levels from 24-inch profile soil test analyses when no N fertilizer was applied. Although new practices have been developed to improve N management in winter wheat, soil sampling in the fall for nitrate-N remains an important practice to manage N efficiently and can result in considerable savings for producers.

When soil sampling for N is not done, the K-State fertilizer recommendation formula defaults to a standard value of 30 lb/acre available N. In this particular dataset, the average profile N level was 39 lb N/acre. However, the N level at individual sites ranged from 11 to 197 lbs N/acre. Most recommendation systems default to a standardized set of N recommendations based on yield goal and/or the cost of N. Without sampling for N or using some alternative method of measuring the soil's ability to supply N to a crop, such as crop sensing, the recommendations made for N will be inaccurate, resulting in a reduction in yield or profit per acre and increased environmental impact.

Failure to account for the N present in the soil wastes a valuable resource and can result in excess foliage, increased plant disease, inefficient use of soil water, and reduced yield. Soil sampling in fall for nitrate-N can have a significant impact on N recommendations for winter wheat in Kansas soils.

Dorivar Ruiz Diaz, Nutrient Management Specialist
ruizdiaz@ksu.edu

8. Status of disease pressure in corn and soybeans

It is middle of August and corn is rapidly progressing toward maturity with many fields in the hard dough to early dent stage of development. At these growth stages, there will be minimal returns to any fungicide applications.

Southern rust

Based on recent scouting trips, there is little, if any, southern rust in the western third of the state at this time. In northeast Kansas, some level of southern rust can be found in many fields, but nothing seen would warrant a fungicide application at this point. Some fields are just silking and scouting should continue in these fields until the late soft dough stage of development.

Gray leaf spot

Late fields not past R2 should be evaluated for gray leaf spot (Figure 1). Some fields have high levels of gray leaf spot, but most of these are at hard dough when fungicide application would not be profitable. Other fields have very little gray leaf spot present. It is not clear if this is because a fungicide was applied, a resistant hybrid was used, or because weather conditions in the field were not conducive to disease development.

Figure 1. Early development of gray leaf spot lesions showing a distinct yellow halo. Photo by Doug Jardine, K-State Research and Extension.

Stalk rot

As corn progresses to maturity, stalk rot is beginning to be identified. In a field near Perry, Kansas, both Fusarium stalk rot and charcoal rot were present. However, in this field, Fusarium was by far the predominant type of stalk rot. Wet springs followed by a period of dry weather, such as we had in July, with a return to frequent rain is an ideal prescription for Fusarium stalk rot. The very hot and dry July would also be conducive to some charcoal rot, especially on drier upland or sandier soils.

Soybean disease update

The soybean crop is amazingly healthy at this point if fields are in the R3 to R5 growth stages. No frogeye leaf spot could be found in northeast Kansas on a recent scouting trip. The predominant disease has been bacterial blight. This disease is associated with big, blowing thunderstorms that spread bacteria around the field. Fungicides will not be effective on bacterial diseases; however, this disease is not known to be yield limiting.

Fungicides for foliar disease problems are not warranted at this point of the season. Growers who had problems in 2018 with seed quality due to pod and stem blight, purple seed stain, and anthracnose may want to consider a fungicide application with the goal of improving seed quality, if not necessarily yield. Beginning pod fill (R5) would be the best time to make this type of application to provide protection longer into the pod-filling stage. Fungicide efficacy ratings for various soybean diseases can be found at: https://cropprotectionnetwork.org/resources/publications/fungicide-efficacy-for-control-of-soybean-foliar-diseases.

Doug Jardine, Extension Plant Pathologist
jardine@ksu.edu

9. First reports of sugarcane aphid on grain sorghum in Kansas

The sugarcane aphid (SCA) has now been reported in four counties in Kansas: Sumner, Reno, Kiowa, and Haskell. Grain sorghum producers in Kansas should begin scouting their fields on a routine basis.

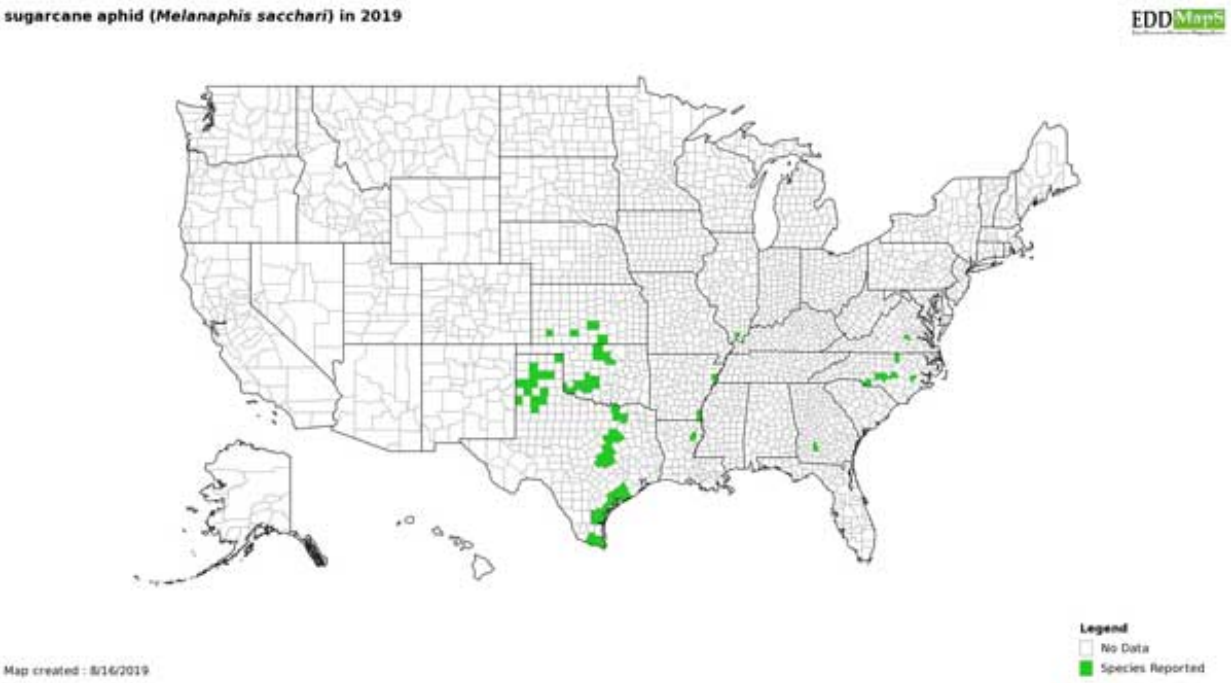


Figure 1. Current status of the SCA. The map indicates only the counties in which the SCA has been found, and does not indicate how many or how few aphids were found in that county. Source: https://www.myfields.info/pests/sugarcane-aphid

What can we expect this season? It's impossible to know for sure at this time. Infestations in Kansas in 2017 and 2018 were sporadic, and most issues were late season (Figure 2). But in 2016, sugarcane aphids were a significant problem on grain sorghum in Kansas, Texas, Oklahoma, and most southern states, and fields were justifiably sprayed to protect yields.

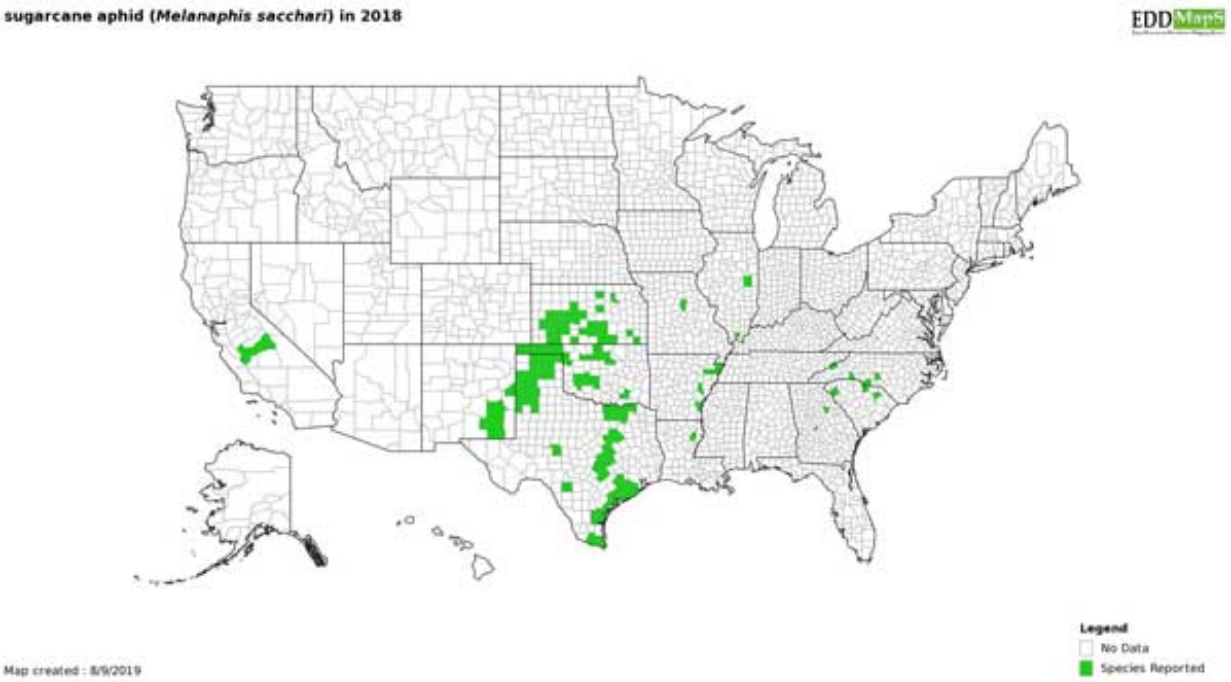
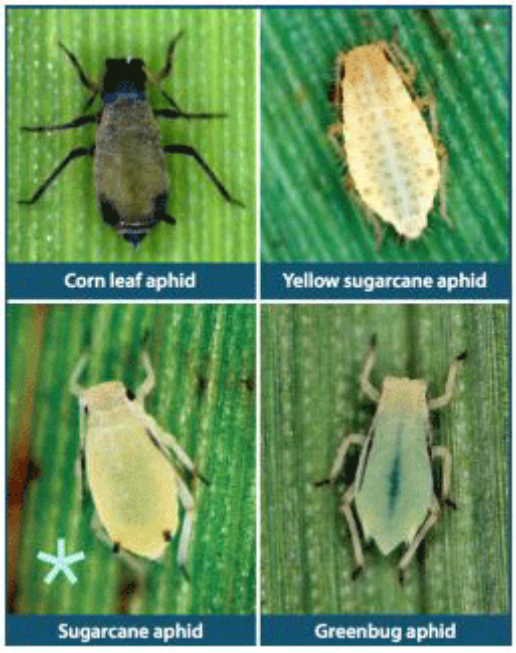


Figure 2. The distribution of SCA in 2018.

Early detection is key to the management of this pest, but treatments should be based on established thresholds. One heavily infested plant does not equal a yield loss. Applying insecticides too soon can result in repeated applications, which occurred during the 2015 season. See scouting and treatment recommendations below.



Scouting time

Plants are vulnerable to infestation by SCA at any growth stage, but Kansas sorghum is most at risk from boot stage onward. The ability of sugarcane aphid to overwinter on Johnsongrass and re-sprouting sorghum stubble represents challenges to the management of this pest in more southerly regions.

Issues arising from SCA in Kansas are likely to become increasingly uncommon with each passing year. However, there is a good amount of late-planted sorghum this year that is going to be more at risk going into late summer. Producers would be wise to scout these late-planted fields.

Sampling method

- Once a week, walk 25 feet into the field and examine plants along 50 feet of row:
- If honeydew is present, look for SCA on the underside of a leaf above the honeydew.
- Inspect the underside of leaves from the upper and lower canopy from 15–20 plants per location.
- Sample each side of the field as well as sites near Johnsongrass and tall mutant plants.
- Check at least 4 locations per field for a total 4 locations per field for a total of 60-80 plants.

If no SCA are present, or only a few wingless/winged aphids are on upper leaves, repeat this sampling method once a week thereafter.

If SCA are found on lower or mid-canopy leaves, begin twice-a-week scouting. Use the same sampling method, but be sure to include % plants with honeydew. Estimate the % of infested plants with large amounts of SCA honeydew (shiny, sticky substance on leaf surface) to help time foliar insecticides for SCA control on sorghum (Table 1).

Table 1. SCA Thresholds

Growth Stage	Threshold
Pre-Boot	20% plants infested with localized area of heavy honeydew and established aphid colonies
Boot	20% plants infested with localized area of heavy honeydew and established aphid colonies
Soft dough	30% plants infested with localized area of heavy honeydew and established aphid colonies
Dough	30% plants infested with localized area of heavy honeydew and established aphid colonies
Black Layer	Heavy honeydew and established aphid colonies in head *only treat to prevent harvest problems **observe preharvest intervals

The myFields web site: Keeping updated on SCA in Kansas and reporting findings

For ongoing current information on SCA in Kansas, check out the myFields web site often in the coming weeks and months: https://www.myfields.info/pests/sugarcane-aphid

It would be helpful if producers would report findings of SCA in their fields on the myFields web site as soon as the insects are found. Reports of findings are used in developing the maps seen in Figures 1 and 2.

The reports used to develop each map are, in part, those submitted through the myFields web site from account holders that also have special permissions as "Verified Samplers." Only reports submitted by these verified samplers get mapped so that we can account for data quality. However, we do encourage any account holder to report their observations on the SCA. Web site administrators can see these reports and can contact the submitter for a confirmation, a great way to get an early detection in new areas. Web site visitors will need to: 1) sign up for an account, 2) log in, 3) to get access to the '*Scout a Field*' feature to make reports. The *Scout a Field* tool is easy, you just map the observation location and select yes or no for SCA presence.

Here is the sign up page: https://www.myfields.info/user/register

Also, if sorghum producers are interested in receiving alerts, which are triggered by new reports submitted by verified samplers, they just need to sign up for a free myFields.info account using the link above. Signing up for an account automatically signs them up for SCA alerts, but they can also opt out of them in their user preferences. The alerts include a statewide email notice when SCA is first detected in the state, and then are localized by county as SCA moves into the state. The notices will also contain latest recommendations and contact info for local Extension experts.

Sarah Zukoff, Entomologist, Southwest Research-Extension Center
(620) 290-1111
snzukoff@ksu.edu

J.P. Michaud, Entomologist, Agricultural Research Center-Hays
jpmi@ksu.edu

Brian McCornack, Entomologist
mccornac@ksu.edu

Wendy Johnson, myFields Coordinator, Entomology Extension Associate
wendyann@ksu.edu

10. Germination testing of wheat seed

The 2019 wheat harvest was affected by severe Fusarium head blight (head scab) in eastern and central Kansas. This disease can reduce germination dramatically in some cases, as well as makes reading and understanding a germination test much more difficult. Having your seed professionally tested for germination is always a good practice, but in this instance, it is highly recommended.

To have an official germination test on the seed, send a two-pound sample to:
Kansas Crop Improvement Association
2000 Kimball Ave.
Manhattan, KS 66502

A germination test will cost $17.00 and a sample submittal form can be printed off from the KCIA website: www.kscrop.org/seed-lab.html

Home testing

If producers want to test their seed for germination at home, it needs to be done correctly to be of value. The following detailed procedure is taken (and slightly modified) from K-State Extension publication AF-82, "Seed Germination Test Methods."

- Place two moistened paper towels (on top of each other) on a flat surface. The towels should not have free water in them.
- Arrange fifty (50) seeds on the towels leaving approximately an inch border around the edges.
- Place two more moistened towels over the seeds.
- Make a ½ to ¾ inch fold at the bottom of the four paper towels. This will keep the seed from falling out.
- Starting on one side, loosely roll the paper towels toward the other side (like rolling up a rug) and place a rubber band around the roll(s).

Place the roll in a plastic bag. Seal, but not completely, so as to keep moisture in but still allow some air into the bag.

For newly harvested seed:

- Place the bag upright in the refrigerator for 5 days and then remove and place upright at room temperature for an additional 5 to 7 days.
- Remove the sample from the bag and unroll the towels.
- Count and record the number of healthy seedlings (adequate root and shoot development and NOT overtaken by disease.)

For carryover seed, or after September 1:

- Place the bag upright at room temperature for 5 to 7 days.
- Remove the sample from the bag and unroll the towels.
- Count and record the number of healthy seedlings (adequate root and shoot development

and NOT overtaken by disease).

To calculate the germination percentage: divide the number of healthy seedlings by the number of seed tested and multiply by 100.

Example: 42 healthy seedlings X 100 = 84% germination

50 seeds tested

This may be repeated more times for each sample in order to obtain more accurate results, testing up to 400 seed.

Eric Fabrizius, Kansas Crop Improvement Association, Seed Laboratory Manager
efkcia@kansas.net

11. Ag-Climate Update for July 2019

The Ag-Climate Update is a joint effort between our climate and extension specialists. Every month the update includes a brief summary of that month, agronomic impacts, relevant maps and graphs, 1-month temperature and precipitation outlooks, monthly extremes, and notable highlights.

July 2019 – Onset of dry weather

July brought a switch to drier-than-normal conditions across most Kansas. State-wide average precipitation for July was 2.5 inches, 67% of normal. Although there were pockets of wetter conditions, only the Southeast Division was above normal with an average of 4.67 inches, 115% of normal. State-wide average temperature for the month was roughly 79 degrees F, almost exactly normal. Temperature swings were great, ranging from 51 degrees F at Pratt 4W on July 23 to 108 degrees F at the Hill City Airport on the 17th.

The rapid switch to drier conditions, coupled with warmer temperatures, resulted in stress to spring-planted crops. Many wheat fields in the central and south-central portions of the state were drowned out due to excessive moisture causing extremely variable yields and test weight. Corn, soybeans, and sorghum continue to lag behind normal progress, due mainly to late planting.

View the entire July 2019 Ag-Climate Summary at http://climate.k-state.edu/ag/updates/

12. Looking ahead - 2019 Fall weather outlook for Kansas

While it has continued to be wet in the east, the western and central parts of Kansas have been drier than normal. Soils in these areas have continued to dry out.

The outlook for September calls for continuation of that pattern with an increased chance of wetter-than-normal conditions across the state. The temperature outlook favors an equal chance for a warmer or cooler than normal pattern across the entire Central Plains. A normal or slightly below-normal precipitation pattern for September would be favorable in the eastern divisions, where saturated soils continue to present problems. Cooler temperatures would slow the normal drying pattern. While slightly cooler temperatures could reduce heat stress, it would also increase disease pressure. Degree day accumulation will be the biggest concern; late planted crops are still lagging in maturity.

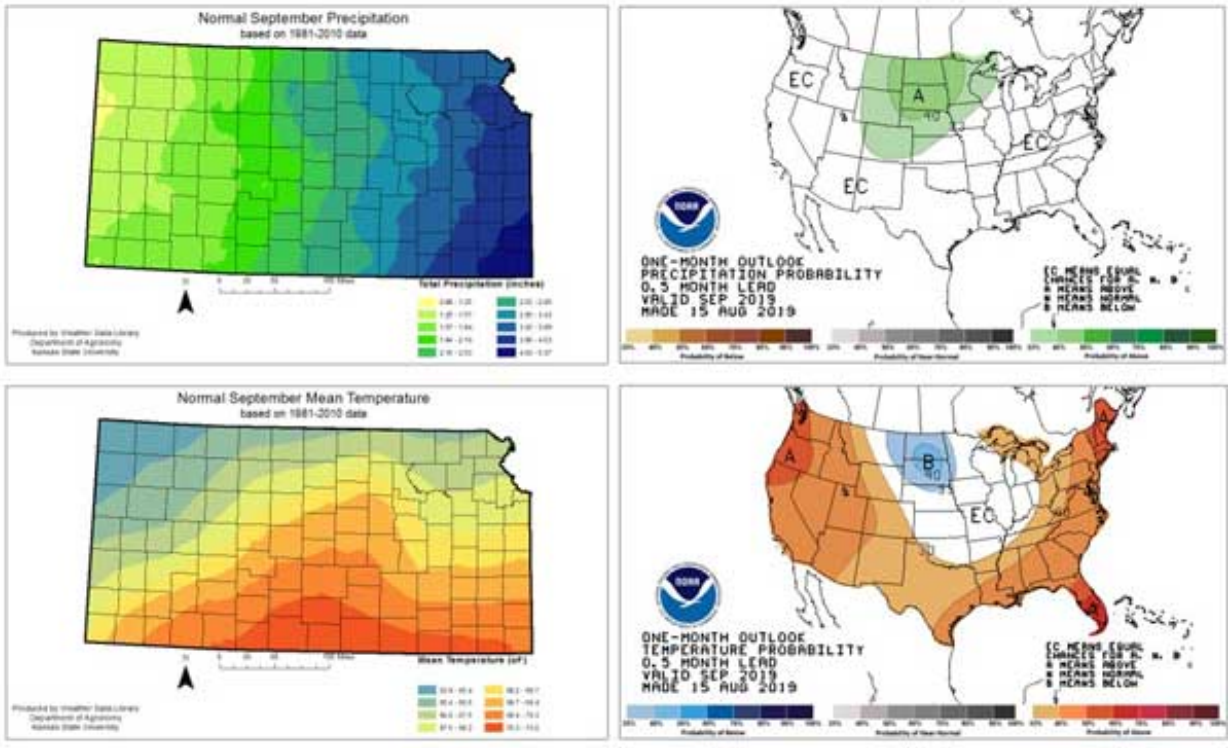


Figure 1. September temperature and precipitation outlooks versus normal for Kansas (WDL and CPC).

Fall temperature outlook

As the outlooks are extended to the fall season, the temperature outlook switches to warmer-than-normal temperatures across the state. However, this does not indicate how those temperatures might be distributed. Another consideration is that average temperatures are on the downward slide towards winter – decreasing each day through September and October. With above-normal

precipitation, surface moisture is abundant across the region. As a result, there will be increased evaporation at the surface which will inject additional moisture into the atmosphere. This additional moisture increases humidity and thus, the heat index as well. It will not take as much "heat" to make conditions feel unbearably warm and heat indices could be quite high despite cooler-than-normal temperatures. September normal high temperatures typically reach low-to-mid 80s for much of the state.

Fall precipitation outlook

Chances of precipitation also fall in the equally likely distribution. A slightly drier-than-normal fall, with well-distributed rains would be much more beneficial than a continuation of the rainy pattern. Although harvest is likely to be later than usual, given the lateness of the crops, a dry pattern would allow for a more rapid harvest than last year. The western third of the state has drier soil moistures at the surface and would benefit more from average precipitation, particularly to establish the fall seed crops such as winter wheat and canola. With increased evaporation and atmospheric moisture, this would increase the likelihood of additional heavy thunderstorms and rapid rain rates across the region when rainfall does occur. Because of this, flooding risks will remain elevated for much of the fall even when dry periods develop between rain events.

The El Niño has been officially ended. This means other factors, such as antecedent conditions, the Madden-Julian oscillation, and placement of ridges will have more influence on how conditions develop.

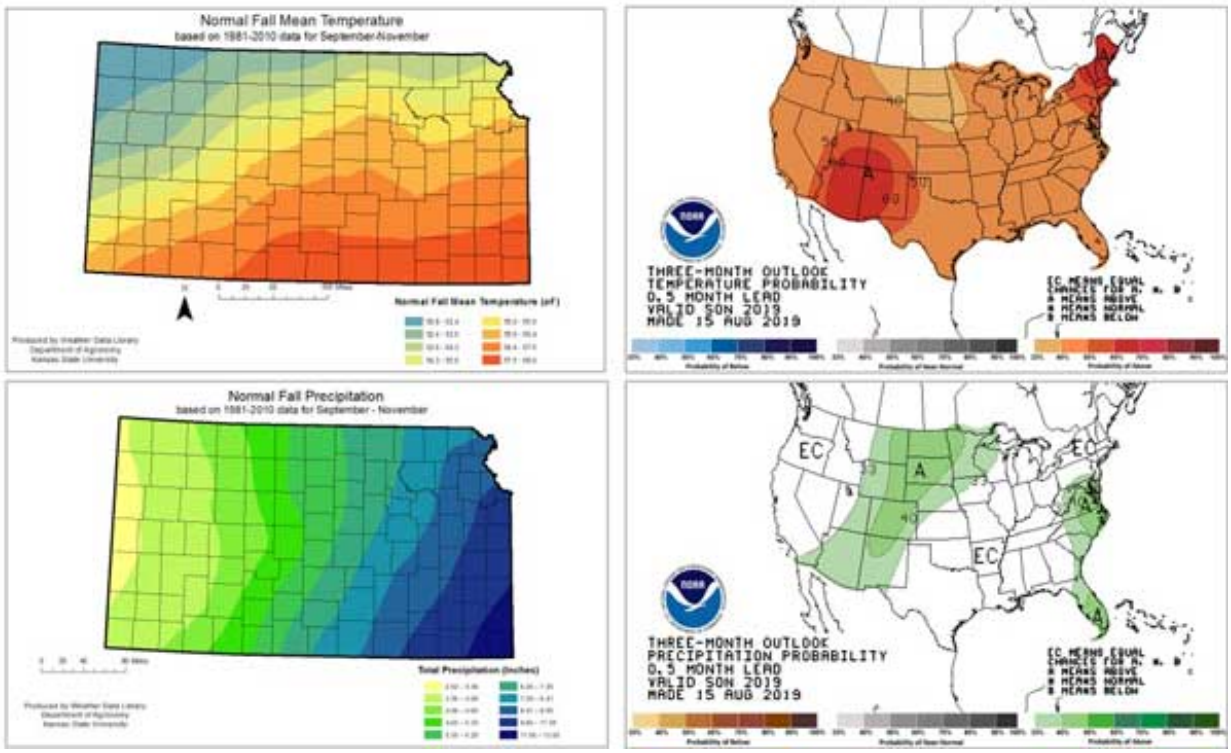


Figure 2. Fall outlooks versus normal for the September, October, November period (WDL and CPC).

Mary Knapp, Weather Data Library/Mesonet
mknapp@ksu.edu

Chip Redmond, Weather Data Library/Mesonet
christopherredmond@ksu.edu

13. 2019 Kansas Performance Tests with Winter Wheat Varieties report available online

The *2019 Kansas Performance Tests with Winter Wheat Varieties* report is now online. In this report, you will find a recap of the 2018-19 wheat crop, with a detailed discussion of factors that made this year a very challenging growing season for some Kansas wheat producers. More importantly, the results of the 2019 wheat variety performance tests are also shown.

Producers and crop consultants can use this resource to help select wheat varieties for their operation by checking for varieties that show a consistently good performance in their region.

Click here to access the online version of the variety performance test results. Results from previous years are available at http://www.agronomy.k-state.edu/services/crop-performance-tests/winter-wheat/index.html

2019 Kansas Performance Tests with

Report of Progress 1151

K-STATE
Research and Extension

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Kansas State University Department of Agronomy
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
www.agronomy.ksu.edu | www.facebook.com/KState.Agron | www.twitter.com/KStateAgron

14. North Central Experiment Fall Field Day, August 20

All interested individuals are invited to attend the **2019 North Central Experiment Field Day** on **Tuesday, August 20, at 6:00 p.m**. The event will be held at the South Unit experiment field located approximately 2.5 miles west of Scandia on Hwy 36.

This is a free event and no pre-registration is required. There will be a catered meal at the end of the program. CCA/CEU credits will be available. Topics and speakers will include:

Corn planting date considerations – Stu Duncan, K-State Northeast Area Agronomist

In-furrow fertilizer with soybeans and soybean stand issues – Dorivar Ruiz Diaz, K-State Soil Fertility and Nutrient Management Specialist

Long-term fertility research and trends – Dorivar Ruiz Diaz and Andrew Esser, Agronomist-in-charge, North Central Kansas Experiment Field

For questions about the event, please call Andrew Esser at 785-335-2836

K-STATE Research and Extension

KSU NCK Experiment Field
Fall Field Day

August 20, 2019
KSU Experiment Field South Unit Location
2.5 miles west of Scandia on Hwy 36
6:00 P.M. Sharp

Tour Topics:

-Corn Planting Date Considerations
Dr. Stu Duncan, KSU Northeast Regional Agronomist

-In-furrow Fertilizer with Soybeans and Soybean Stand Issues
Dr. Dorivar Ruiz-Diaz, Soil Fertility and Nutrient Management Professor K-State

-Long-Term Fertility Research and Trends
Dr. Dorivar Ruiz-Diaz and Andrew Esser, Agronomist-in-Charge NCK-Exp. Fields

Free Event

No registration required
Catered Dinner to Follow Program
Questions Call: 785-335-2836
Andrew Esser, Agronomist-in-Charge

Meeting sponsored by: K-STATE Research and Extension

CCA CEU's available

15. East Central Experiment Field fall field day - August 21

The East Central Experiment Field in Ottawa will host its fall field day on **Wednesday, August 21**. The event will begin at 9:00 a.m. with registration, coffee, and doughnuts. The field day program will begin at 9:30 a.m. A complimentary lunch will be served at noon to conclude the event.

Field day topics and speakers include:

- **Dr. Dallas Peterson – Dicamba injury to non-Xtend soybeans**
- **Dr. Dorivar Ruiz Diaz – Effect of split late N application to corn on yield and nitrogen use efficiency**
- **Malynda O'Day – Cover crop management for weed suppression**
- **Chip Redmond – Making the most of the Mesonet: A resource to aid herbicide application**

The field day is located at the East-Central Experiment field near Ottawa. From I-35 at the Ottawa exit, go south 1.7 miles on Hwy 59, then east 1 mile, and south 0.75 mile.

Certified Crop Advisor and Commercial Pesticide Applicator credits have been applied for. Please contact the East-Central Research Station at 785-242-5616 at least two days prior to the event if accommodations are needed for persons with disabilities or special requirements. The field day is sponsored in part by the Kansas Corn Commission.

Kansas State Research & Extension

KSU Agronomy Ottawa Field Day

Wednesday, August 21th, 2019

East-Central Experiment Field

Ottawa, KS

From I-35 at Ottawa: South 1.7 miles on 59 Hwy, East 1.0 mile, South 0.75 mile

9:00..... Registration, coffee, and doughnuts

9:30..... Program begins

Dr. Dallas Peterson- "Dicamba injury to non-Xtend soybeans".

Dr. Dorivar Ruiz Diaz – Effect of split late N application in corn on yield and nitrogen use efficiency.

Malynda O'Day- Cover crop management for weed suppression.

Chip Redmond- Making the most of the Mesonet: a resource to aid herbicide application.

12:00..... Lunch

Certified Crop Advisor and Commercial Pesticide Applicator Credits have been applied for. Please contact the East-Central Research Station at 785-242-5616 at least two days prior to this event if accommodations are needed for persons with disabilities or special requirements. Field Day sponsored in-part by the Kansas Corn Commission.

Kansas State University Research & Extension is an Equal Opportunity Provider and Employer