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

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1. Wheat streak mosaic: The importance of early control of volunteer wheat

The severe problems wheat producers had with wheat streak mosaic virus in years past can be traced back, in most cases, to a lack of control of volunteer wheat. Problems with wheat production the previous year can leave large amounts of seed on the soil surface. As this seed germinates, it creates a "green bridge", allowing wheat streak mosaic and wheat curl mites to survive locally.

Challenges faced in 2019

This year, the wheat crop faced several challenges that might increase the amount of seed left behind after harvest, which would also increase the amount of volunteer wheat (Figure 1). These problems included hailed out wheat, head scab (Fusarium head blight), and a large region affected by waterlogged conditions. One of the recommendations to fields affected by head scab is to increase the fan speed of the combine and "blow" the diseased kernels out of the harvested grain. Likewise, waterlogged conditions decreased wheat kernel weight and likely increased harvest losses of grain. These smaller kernels might germinate into volunteer wheat increasing the risk of severe wheat streak mosaic the following year.

Figure 1. Thick stand of volunteer wheat after wheat harvest. Photo by Stu Duncan, K-State Research and Extension.

Wheat curl mites will move off growing wheat as the green tissue dries down and dies. After moving off the existing wheat at or near harvest time, the mites need to find green tissue of a suitable host soon or they will die of desiccation.

Producers often like to wait several weeks after harvest before making their first herbicide application to control volunteer wheat. This allows as much volunteer as possible to emerge before spraying it or tilling it the first time. Often, a second application or tillage operation will be needed later in the summer to eliminate the green bridge to wheat by making sure all volunteer is dead within ½ mile of wheat being planted in the fall. Wet weather prevails through late summer often favors multiple flushes of volunteer wheat and also favors the growth of other grassy weeds that can also support moderate populations of the curl mites and virus. These weather patterns keep a lot more alternate host plants alive during the critical period when mites and virus would not have plants to survive on.

If volunteer has emerged and is still alive shortly after harvest in hailed-out wheat, wheat curl mites could easily build up rapidly and spread to other volunteer wheat that emerges later in the season. On the other hand, if this early-emerging volunteer is controlled shortly after harvest, that will help greatly in breaking the green bridge. However, if more volunteer emerges during the summer, follow-up control will still be needed.

Other hosts for the wheat curl mite

Volunteer wheat is not the only host of the wheat curl mite. Over the years, multiple research studies have evaluated the suitability of wild grasses as hosts for both the curl mite and the wheat streak virus. There is considerable range in the ability of a grassy weed species to host the mite and the virus. Barnyardgrass is among the more suitable hosts for both virus and mites, but fortunately it is not that common in wheat fields. In contrast, various foxtails, although a rather poor host, could be an important disease reservoir simply because of their abundance. These grasses may play an important role in allowing the mites and virus to survive during the summer months particularly in the absence of volunteer wheat.

The K-State Research and Extension publication, MF3383 - *Wheat Streak Mosaic*, includes information about grassy weed hosts of the mite and virus, and the contribution of these hosts to the risk of severe wheat streak mosaic infections. Take note of significant stands of these grasses in marginal areas and control them as you would volunteer wheat.

If volunteer wheat and other hosts are not controlled throughout the summer and are infested with wheat curl mites, the mites will survive until fall and could infest newly planted wheat. Wheat curl mite infestations of wheat often lead to wheat streak mosaic infections (Figures 2 and 3).

Figure 2. Volunteer wheat on the edges of a sunflower field were infested with wheat curl mites and caused a wheat streak mosaic infection in the adjacent wheat crop that fall. Photo by Stu Duncan, K-State Research and Extension.

Figure 3. Close-up of wheat showing symptoms of a wheat streak mosaic virus infection in the fall. Photo by Jeanne Falk Jones, K-State Research and Extension.

Genetic resistance to wheat streak mosaic can also reduce the risk of severe disease problems. There are currently three varieties adapted to Kansas that have wheat streak mosaic resistance: Clara CL (white), Joe (white), and Oakley CL (red). All of these varieties have the same resistance source (*WSM2*). This resistance helps but does have some serious limitations. For example, this resistance is effective against wheat streak mosaic but does not cover triticum mosaic or high plains (two other viral diseases also spread by the wheat curl mites). The resistance conferred by WSM2 is also temperature sensitive and is much less effective at high temperatures. If wheat is planted early for grazing or if high temperatures persist into October, the resistance is much less effective.

In addition, there are a handful of varieties with resistance to the wheat curl mite, including TAM 112, Byrd, Avery, Langin, and T158. These varieties are actually susceptible to the viral diseases, but they generally slow the development of the mite populations in the fall. This resistance can help reduce the risk of severe disease but will not provide enough protection if wheat is planted in close proximity to volunteer wheat or other hosts infested with large populations of the curl mites and virus.

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2. Response of vegetation to flooding

Excessive rainfall across much of Kansas this spring led to flooding in many locations. Vegetation response to flooding depends primarily on duration and frequency. Flooding impacts the amount of oxygen, carbon dioxide, temperature, and light available for photosynthesis. Impeded gas exchange results in a depletion of carbohydrate reserves, reduced energy available to the plant, disruption of cellular function, and impairs nutrient uptake, resulting in plant death. Loss of vegetation is also temperature dependent. It takes fewer days of submergence to cause stand loss as soil temperatures increase.

Most annual crops such as wheat, rye, oats, and barley tolerate only brief flooding, i.e. three to six days. Cool-season perennial grasses such as smooth brome (24-28 days) and tall fescue (24-35 days) tolerate longer periods. Bermudagrass is tolerant of very long periods of flooding (45-90 days). Legumes that might be mixed with cool-season grasses including annual lespedeza (5-8 days), red clover (7-15 days), alfalfa (9-12 days), and white clover (10-20 days) are less tolerant to flooding.

Considerable variation exists among native grasses in their tolerance to water submersion. Little bluestem tolerates only brief periods of flooding (3-6 days). Big bluestem and Indiangrass will tolerate only 7-14 days of flooding, whereas switchgrass tolerates 15-30 days. Eastern gamagrass will tolerate 10-22 days. Although buffalograss is shorter than most species, it will tolerate 45-90 days of standing water. A lowland species that is known to tolerate greater than 49 days of flooding is reed canarygrass.

Some invasive species such as yellow bluestem (3-6 days) and sericea lespedeza (10 days) have limited flood tolerance.

Flooding may indeed kill or damage many species, but certain species may survive. Sand deposition and lack of vegetative cover may require reseeding of flood-damaged areas. Consider planting species that are more tolerant of flooding, especially frequently flooded sites.

Figure 1. Pasture flooded in May 2019. Depth finder indicated 12 feet of water in the center of the native range/50% fescue pasture. Water standing on the surface for 25 days. Photo by Jaymelynn Farney, K-State Research and Extension.

Figure 2. Same pasture as in Figure 1 one month after water receded. Before the flooding, the pasture contained heavy grass and forbs, numerous cedar trees, and no bare spots. After the flood, the cedar trees and other brushy plants appear dead. Reed canary grass and other marsh grasses represent current visible growth. Photo by Jaymelynn Farney, K-State Research and Extension.

Figure 3. Fescue pasture that was underwater for up to 18 days. Area towards the back of the photo had water up to the base of the hunting blind, 10 feet off the ground. Now, forage composition predominately reed canary grass. Brush and cedar trees do not seem to be impacted in this area. In foreground, uphill side of pasture was underwater for 10 days and still has solid stand of fescue and forbs. Photo by Jaymelynn Farney, K-State Research and Extension.

For more information please see: National Range and Pasture Handbook, a USDA-NRCS publication.

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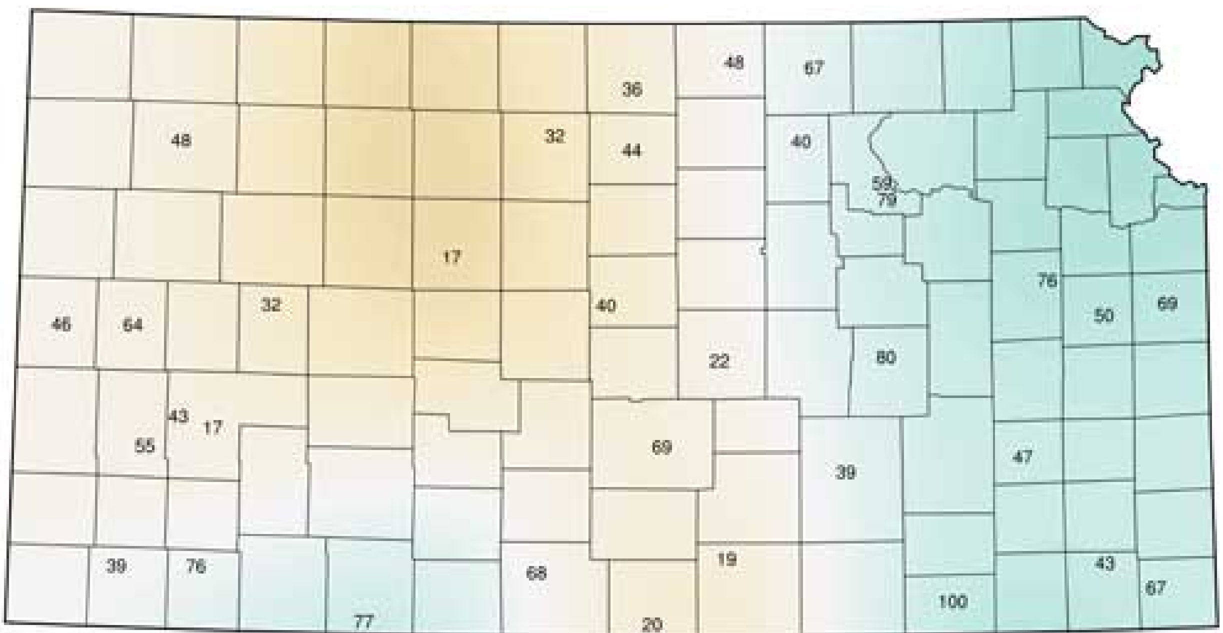
3. Potential causes for stressed corn this growing season

Since spring 2019 brought the wettest May on record for Kansas and cooler-than-normal temperatures, rains have been somewhat sporadic in recent weeks and warmer temperatures have finally arrived. Some of the dryland corn crop is experiencing a combination of heat and water stress (too much water). Moisture levels have varied from excessive in many areas early in the season to dry near the soil surface as corn is entering or already at the reproductive stages (Figure 1). Since the growing season is progressing very quickly, it is best to be prepared to take a close look for symptoms of potential drought stress.



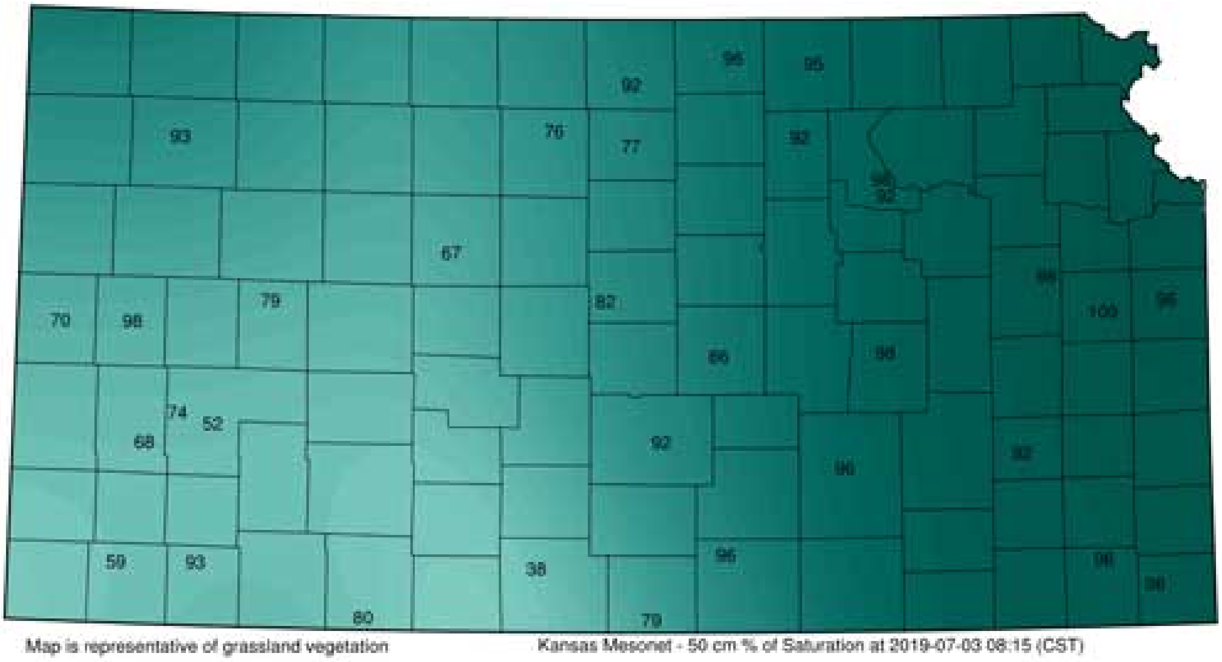


Figure 1. Surface (2-inch, upper map) versus deep (20-inch, lower map) soil saturation levels. Maps by Kansas Mesonet.

Conducting field work -- including planting, tillage, or traffic in general -- after wet weather can cause soil compaction, and in particular sidewall compaction in the seed furrow. The worst cases of sidewall compaction are seen after a field has been planted when the soil was too wet, followed by a period of dry weather. If the soil stays moist, the roots are usually able to grow through the walls of the seed furrow. But if the soil gets dry, the roots can have a harder time growing through that seed furrow wall, and instead grow along the furrow, resulting in what is referred to as sidewall compaction (Figure 2). With corn, the plants might look fine for a while, but the symptoms of this problem will probably show up after the plants get to be several inches tall. Symptoms will look like drought stress, nutrient deficiency, or both.

Figure 2. Sidewall compaction in heavy clay soil. Photo by Stu Duncan, K-State Research and Extension.

Early season effects

Under stress conditions (for too much water or drought), shorter, less leafy plants are among the most visible symptoms. Plants may not be as green as usual if chlorophyll production is affected. The root systems will be smaller under these conditions since all below- and above-ground plant growth will be affected (Figure 3). Those symptoms are the outcome of plants that are less efficient in growing as photosynthesis is slowing down.

Figure 3. Effect of stress on root systems. On the left is a plant with a smaller root system and stalk diameter caused by stress. On the right is an unstressed corn plant, with greater root system, more nodal roots, and greater stalk diameter. Photo by Ignacio Ciampitti, K-State Research and Extension.

Critical period before and after silking

Note: It is difficult to think of drought stress when this season has been quite wet, but things could change fairly quickly and corn is moving quite fast in many areas of the state. At what stage of growth is corn most sensitive to moisture stress? To answer the question, we need to know the most important growth stages for grain determination. The final number of kernels for corn is determined around the pollination period (2 weeks before and 2 weeks after flowering). Thus, corn is extremely sensitive to stress during that period. Stress directly affects the final number of kernels through different processes, such as:

1. Potential delays in silking (asynchrony between the development of male and female reproductive parts). This happens when the tassel is shedding pollen but the ear is not yet receptive (silks are not yet out of the husk).

2. Potential reductions in ear size (smaller ears with less physical space for bearing grains).

3. Shorter time for pollen receptivity. This occurs when the silks dry out very fast under warm temperatures, impeding a successful pollination.

4. Pollination is concentrated in just a few days. In general, pollination takes place earlier and with a short duration under drought stress. High temperatures can also potentially impact pollen viability.

5. Even when pollination is effective, kernel abortion or cessation can occur right after flowering, in the blister and milk stages, if drought stress continues.

Under extreme moisture and heat stresses, plants may be barren, with no ears being formed at all, if conditions were severe well before pollination time. Overall reductions in potential yield can be expected whether the stress occurs early (10-leaf to 15-leaf stages) or late (dough and dent stages) in the crop growing season.

Figure 4. Leaf rolling in corn under stress during early reproductive stages. Photos by Ignacio Ciampitti, K-State Research and Extension.

Management practices and other factors

From a management practice perspective, situations that tend to make corn more susceptible to stress include high plant densities, narrow row spacing, and excessive applications of fertilizer or manure. Planting conditions, as highlighted above, are one of the key factors potentially impacting this year root growth (due to compaction) and therefore, this could potentially exacerbate stress symptoms.

In summary, scout your acres for plant stress symptoms. The impacts of the stress on grain yield can be known with more precision right around flowering time.

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4. Prevented plant acres planted to cover crops: Kansas NRCS program and RMA rule changes

USDA-NRCS

On June 28 the Kansas NRCS announced a special Environmental Quality Incentives Program (EQIP) sign-up to assist farmers with part of the cost for planting cover crop on prevented plant acres. To be eligible farmers must be in one of the Governor-declared counties in Kansas who could not plant their crops because of flooded or wet fields. The deadline to apply is **July 26, 2019**. Farmers are encouraged to contact their local NRCS office to determine their eligibility and apply for this assistance.

Some considerations to be aware about when considering this program include:

1. Grazing the cover crops will be permitted after September 1.

2. Haying the cover crop is not permitted.

3. Chopping the cover crop for silage is not permitted.

USDA-RMA

In addition to the Kansas NRCS special EQIP program announcement, the USDA Risk Management Agency (RMA) on announced on June 20 a nationwide change to the Haying and Grazing date for prevented plant acres planted to cover crops. For this year only, on or after September 1, 2019, farmers can hay, graze, or cut cover crops for silage, haylage, or baleage on prevented plant acres and still maintain their eligibility for full 2019 prevented planting indemnity.

Summary

In summary, farmers considering the Kansas NRCS special EQIP incentive program need to be aware that the program requirements are more restrictive than the 2019 USDA-RMA rules for haying and grazing prevented planting acres planted to a cover crop.

For additional information, please see the following press releases:

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ks/newsroom/releases/?cid=NRCSEPRD1466430

https://www.rma.usda.gov/en/News-Room/Press/Press-Releases/2019-News/RMA-Announces-Change-to-Haying-and-Grazing-Date

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5. 2018 Kansas Summer Annual Forage Hay and Silage Variety Trial final report

In 2018, summer annual forage variety trials were conducted across Kansas near Garden City, Hays, and Scandia. All sites evaluated hay and silage entries. Companies were able to enter varieties into any possible combinations of research sites, so not all sites had all varieties. Across the sites, a total of 77 hay varieties and 87 silage varieties were evaluated. The full 2018 Kansas Forage Report can be accessed online at https://newprairiepress.org/kaesrr/vol5/iss3/1/.

Study Objectives

The objectives of the Kansas Summer Annual Forage Variety Trial are to evaluate the performance of released and experimental varieties, determine where these varieties are best adapted, and increase the visibility of summer annual forages in Kansas. Breeders, marketers, and producers use data collected from the trials to make informed variety selections. The Summer Annual Forage Trial is planted at locations across Kansas based on the interest of those entering varieties into the test.

This work was funded in part by the Kansas Agricultural Experiment Station and seed suppliers. Sincere appreciation is expressed to all participating researchers and seed suppliers who have a vested interest in expanding and promoting annual forage production in the U.S.

Inestimable differences in soil type, weather, and environmental conditions play a part in increasing experimental error, therefore one should use more than one location and one year of data to make an informed variety selection decision. Please refer to previous years' forage reports to see how a variety performed across years.

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6. New KSRE publication on Fusarium head blight (head scab) in wheat

A new publication from the Plant Pathology Department and K-State Research and Extension is now available. This publication, MF3458 – "Fusarium Head Blight" aims to assist producers in identifying this disease and offers best management options.

While Fusarium head blight is only a problem in approximately 3 out of 10 years, many growers across portions of eastern and central Kansas have reported symptoms in 2019. The disease is rare in western Kansas, where dry conditions generally suppress disease development; however, the disease may occur in irrigated fields in western Kansas. A recent eUpdate article in Issue 753, "Dealing with Fusarium head blight (head scab) in wheat", can be found at https://ksu.ag/2Rs7Vqm.

Some quick facts about Fusarium head blight

- Fusarium head blight causes large tan lesions that encompass large portions of the wheat head.
- The disease damages the grain directly, with infected kernels appearing white and chalky. Some kernels have a pink discoloration.
- The fungus that causes Fusarium head blight survives in the residues of corn, wheat, barley, oats, and many wild grasses. Infection takes place during flowering or early stages of grain development and is favored by damp weather.
- No single management option provides high levels of disease control; therefore, the disease is best managed with a combination of genetic resistance and fungicides.
- Disease losses can be reduced by harvesting fields with the lowest disease levels first, adjusting harvest equipment to remove diseased kernels, and segregating loads of healthy and diseased grain.

You can view the entire publication at https://www.bookstore.ksre.ksu.edu/pubs/MF3458.pdf.

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