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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. Purple color in corn seedlings: Cause for concern?

The rainy season, in combination with unusual low temperatures, are causing slow plant growth for all summer crops, including corn. Cold temperatures and saturated soils are not only affecting corn stands through uneven emergence and lack of uniformity, but are also causing a phenomenon in young corn seedlings known as "purple corn."

In many cases when the purple color is identified in small corn plants, the first thought that comes to the mind of agronomists and producers is that this could be an indication of "phosphorus deficiency." Phosphorus deficiency is also generally associated with stunted plants and thin stalks. Other potential causes of purple color can be hybrid-related, a buildup of sugars (sunny days/cold nights), and restricted root growth. Thus, the question becomes: **What is the main factor affecting the plant color if the crop otherwise looks very healthy, uniform, and vigorous?**

In recent years, purple coloring on corn seedlings has been documented in different environments under diverse management practices and hybrids. The color is coming from the expression of genes for anthocyanin pigment formation. Multiple genes govern the expression of this color, and certain "cold sensitive" genes react to low temperatures (40-50 degrees F). Therefore, low nighttime temperatures such as those we have experienced at times over the past several days/weeks will promote purpling in corn seedlings. This condition is only expressed up until the six-leaf (V6) stage. Producers do not need to worry about this phenomenon. As soon as the temperature warms up and plants grow rapidly, the purple color should disappear (after the six-leaf stage). If not, then consider taking a soil sample for potential phosphorous deficiency.

At this point, the purple color is simply the result of a small degree of cold temperature stress -- nothing severe. The plant is growing very slowly due to the cool weather (not related to the purple color), but good growth and development should resume after the temperatures go back to the normal for this time of year.

Will the yield be affected by this stress? Previous information collected by several researchers concluded that yield is not likely to be affected by this phenomenon. Still, it is always good to continue scouting your acres for early identification of any potential problem affecting your crops.

Figure 1. Purple coloration in corn at diverse growth stages -- a result of the expression of genes for anthocyanin pigment formation. A close-up look with a microscope reveals that the pigment is only present on the top layer of the leaf tissues, without affecting the chlorophyll. The purpling effects varied with the leaf position in the canopy, with no clear pattern. Photos by Ignacio Ciampitti, K-State Research and Extension.

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2. Soybean response to standing water and saturated soils

Soybean planting is well underway in Kansas (52% planted), based on the USDA-NASS Crop Progress and Condition Report from May 24, 2020. Recent heavy rainfall in portions of Kansas may have resulted in standing water in some fields.

Figure 1. Soybean slowly emerging and showing lack of uniformity. Photo by Ignacio Ciampitti, K-State Research and Extension.

Wet soil conditions will slow emergence, make the soil more susceptible to compaction (limiting root growth), and cause poor plant-to-plant uniformity after emergence. Sidewall compaction occurs when soybeans are planted when the soil is too wet, immediately followed by dry weather. Soil surface crusting is another potential challenge for soybean emergence.

After emergence, how will soybeans respond to standing water and saturated soil conditions?

If soybean plants are submerged for less than 48 hours, there is a good chance they will survive. Plants can survive under water longer under cool than warm temperatures. Submerged soybean plants can survive for up to 7 days when temperatures are less than 80 degrees F.

Figure 2. Soybean seedlings under water. Photo by Doug Shoup, K-State Research and Extension.

To find out whether the soybeans are damaged after the water recedes, split the stem at the tip and examine the growing point. A healthy growing point will be firm and white or cream colored. A soft, dark growing point indicates injury. In some cases, the silt coating the plant after short-term flooding can cause more injury and plant death than the water itself.

Even if the fields did not have standing water and plants were not totally submerged, waterlogged soils can cause problems if the waterlogging lasts too long. When soils are saturated for a prolonged period of time, a lack of oxygen in the roots can lead to the accumulation of lactic acid and other products of anaerobic respiration. This is the underlying cause of damage to plants in waterlogged

soils where only the roots are flooded.

Injury can depend on variety, growth stage, duration of waterlogging, soil texture, fertility levels, and diseases present. Interactions of these factors make it hard to predict how a given soybean field will react to waterlogged soils.

Figure 3. Soybean seedlings under full submersion. Photo by Ignacio Ciampitti, K-State Research and Extension.

Variety differences have been reported and researchers have identified possible genes associated with tolerance to waterlogged conditions. Scientists in Missouri have screened a number of soybean varieties, subjecting them to two periods of flooding, each two weeks in duration. The average yield reduction for all varieties was 61%. Yields were reduced by 39% for the most tolerant varieties and 77% for the least tolerant. Producers should check with their seed supplier regarding information about a particular variety.

Growth stage factors

Research examining the influence of growth stage on the degree of injury from waterlogged soils has provided mixed results.

- Germination. Saturated conditions during germination can reduce successful germination by up to 40% and can inhibit seedling growth. Seeds that are further along in the germination process at the time of saturation sustain more injury.
- Vegetative growth stages. Excess water during vegetative stages usually causes less injury than waterlogging during the reproductive and grain filling stages. Short-term waterlogging (2 to 3 days) at V2 to V4 can cause yield reductions of 0% to 50%, depending on soil texture,

variety, and subsequent weather. Yield reductions from waterlogging during the early vegetative stages have been attributed to reduced number of plants and shorter plants with reduced branching and fewer pods per plant.
- For the reproductive period, waterlogging at R1 reduced the number of pods per node. At R5, yield reductions have been attributed to reduced seed size.

Duration of soil saturation

The longer the soil is saturated, the greater the injury, mortality, and consequent yield reductions. During germination, saturated conditions for 48 hours can decrease germination by 30% to 70% depending on the timing of the saturation, nearly twice the yield decrease resulting from durations of 24 hours or less. For plants that have emerged, a waterlogged condition that lasts for less than two days often causes little or no noticeable yield reduction. Intolerant varieties begin to show yield reductions after 2 days of saturation, but tolerant varieties can withstand up to 4 days of waterlogging with little reduction in yield. As the duration of soil saturation increases, researchers have documented greater reductions in population, height, pods per plant, yield, and leaf tissue nitrogen.

Other factors

Soil conditions play a role in the severity of injury from waterlogging as well. Coarser textured soils will drain more quickly, minimizing the duration of oxygen deprivation to the roots. Fine textured soils maintain saturation longer, increasing the chances of injury.

Fields that are flooded, or are at or above the water-holding capacity of the soil, will be more likely to develop root rot problems. Flooding accompanied by cooler temperatures would be favorable to *Pythium* root rot whereas warmer temperatures would favor *Phytophthora* and *Rhizoctonia* root rots. Whether *Phytophthora* root rot develops often depends on the tolerance or resistance of the variety used. If the flooding occurs beyond the first week or two after emergence, any seed treatment fungicides that may have been used will no longer be effective.

Figure 4. Stand loss in a wet area due to Phytophthora root rot. Photo by Doug Jardine, K-State Research and Extension.

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3. Pre-harvest weed control in wheat

Drought, freeze, and other problems have impacted wheat stands in many areas of Kansas this year. The resulting thin stands in those areas have caused weeds to start showing up in many wheat fields -- especially in fields not treated earlier. When broadleaf weeds are given the opportunity to grow rapidly in wheat fields at the end of the growing season, several potential concerns arise, including harvest difficulties, dockage problems, weed seed production, and soil water depletion. No one wants to spend extra money on a below-average crop, but it may be necessary in some cases.

Figure 1. Weeds in wheat near harvest time. Photo by Dallas Peterson, K-State Research and Extension.

Unfortunately, there aren't many good options for pre-harvest treatments in wheat. Listed below are the various herbicide options producers can use as pre-harvest aids in wheat (Table 1). There are differences in how quickly they act to control the weeds, the interval requirement between application and grain harvest, and the level or length of control achieved. All of them will require thorough spray coverage to be most effective.

Another herbicide that is sometimes mentioned as a possible pre-harvest treatment is paraquat. **Paraquat is not labeled for pre-harvest treatment in wheat.** Application of paraquat to wheat is an illegal treatment and can result in a quarantine and destruction of the harvested grain, along with severe fines.

Table 1. Herbicides for use a pre-harvest weed control options in wheat.

Product and rate	Advantages	Disadvantages	Comments
Aim EC (1 to 2 fl oz)	Acts quickly, usually within 3 days.	Controls only broadleaf weeds. 7 day pre-harvest interval. Regrowth of weeds may occur after 2-3 weeks or more, depending on the rate used.	Apply after wheat is mature. Always apply with 1% v/v crop oil concentrate in a minimum spray volume of 5 gal/acre for aerial application and 10 gal/acre for ground applications. Do not apply more than 2 oz of Aim during the growing season.
Dicamba (0.5 pt)	Controls many broadleaf weeds.	A waiting period of 7 days is required before harvest. Acts slowly to kill the weeds. Controls only broadleaf weeds. High potential for spray drift to susceptible crops.	Apply when the wheat is in the hard dough stage and green color is gone from the nodes of the stem. Do not use treated wheat for seed unless a germination test results in 95% or greater seed germination.
Glyphosate (1 qt of 3 lb ae/gal product, or 22 fl oz of Roundup PowerMax or WeatherMax)	Provides control of both grasses and susceptible broadleaf weeds.	Acts slowly. May take up to 2 weeks to completely kill weeds and grasses. Cannot harvest grain until 7 days after application. Kochia, pigweeds, and marestail may be resistant.	Apply when wheat is in the hard dough stage (30% or less grain moisture). Consult label for recommended adjuvants. Not recommended for wheat being harvested for use as seed.
Metsulfuron (0.1 oz)	Provides control of susceptible broadleaf	Acts slowly.	Apply when wheat is in the dough stage.

	weeds.	Cannot harvest grain until 10 days after application. Controls only susceptible broadleaf weeds. Kochia, pigweeds, and marestail may be resistant.	Always apply with a nonionic surfactant at 0.25 to 0.5% v/v. Generally recommended in combination with glyphosate or 2,4-D. Do not use on soils with a pH greater than 7.9. Weeds growing under limited moisture may not be controlled. Do not use treated straw for livestock feed.
Sharpen (1 to 2 fl oz)	Short waiting interval before harvest – 3 days. Straw may be fed to livestock.	Controls only broadleaf weeds. May take up to 10 days for full effect. 1 month rotation interval for soybean.	Apply when wheat is in the hard dough stage (30% or less grain moisture). Always apply with 1% v/v methylated seed oil *and* 1 to 2% w/v AMS or 1.25-2.5% v/v UAN in a minimum spray volume of 5 gal/acre for aerial application and 10 gal/acre for ground applications.
2,4-D LVE (1 pt of 4lb/gal product or 2/3 pt 6 lb/gal product)	Provides control of susceptible broadleaf weeds.	Acts slowly. Weak on kochia and wild buckwheat. Cannot harvest grain until 14 days after application.	Apply when wheat is in the hard dough stage to control large, actively growing broadleaf weeds. Weeds under drought stress may not be controlled. Do not use treated straw for livestock feed.

It is very difficult to estimate the value of pre-harvest weed treatments as it will depend in part on the differences a treatment would have on harvest efficiency and dockage. It may not pay to treat wheat with lower weed densities unless harvest is delayed. If the weeds are about to set seed, a pre-harvest treatment can go a long way toward reducing weed problems in future years by preventing seed production.

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4. Double crop options after wheat

Double cropping after wheat harvest can be a high-risk venture. The available growing season is relatively short. Heat and/or dry conditions in July and August may cause problems with germination, emergence, seed set, or grain fill. Ample soil moisture in some locations this year could aid in establishing a successful crop after wheat harvest.

The most common double crop options are soybean, sorghum, and sunflower. Other possibilities include summer annual forages and specialized crops such as proso millet or other short-season summer crops – even corn. Cover crops are also an option for planting after wheat.

Be aware of herbicide carryover potential

One major consideration before deciding to plant a double crop or cover crop after wheat is the potential for herbicide carryover. Many herbicides applied to wheat are in the sulfonyl urea herbicide family and have the potential to remain in the soil after harvest. If an herbicide such as Finesse, Glean, or Ally has been used, the most tolerant double crop will be sulfonylurea-resistant varieties of soybean (STS, SR, Bolt) or other crops. If you chose to use herbicide resistant varieties, be sure to match the resistance trait with the specific herbicide (not just the herbicide group) that you used. Less information is available regarding herbicide carry over potential of wheat herbicides to cover crops. There is little or no mention of rotational restrictions for specific cover crops on the labels of most herbicides. However, this does not mean there are no restrictions. Generally, there will be a statement that indicates "no other crops" should be planted for a specified amount of time, or that a bioassay must be conducted prior to planting the crop. A recent eUpdate article, "Herbicide carryover considerations when re-cropping damage wheat" (Issue 796, April 24, 2020), summarized the carryover potential of many herbicides applied to wheat.

Burndown of summer annual weeds present at planting is essential for successful double-cropping. Glyphosate used to be effective, but if glyphosate-resistant kochia and pigweeds are present, alternative treatments such as paraquat may be required. Dicamba or 2,4-D may also be considered, if the soybean varieties with appropriate herbicide resistance traits are planted.

Management considerations, production costs, and yield expectations for several double crop options are discussed below.

Soybeans

Soybeans are probably the most commonly used crop for double cropping, especially in central and eastern Kansas (Figure 1). With glyphosate-resistant varieties, often the only production cost for planting double crop soybeans in recent years has been the seed, an application of glyphosate, and the fuel and equipment costs associated with planting and harvesting. However, with the development of glyphosate-resistant weeds, additional herbicides may be required to achieve acceptable control and minimize the risk of further development of resistant weeds.

Figure 1. Soybeans planted as a double crop following wheat at the Ashland Bottoms Research Farm in Manhattan. Photo by Kraig Roozeboom, K-State Research and Extension.

Weed control. The cost for weed control cannot really be counted against the soybeans, however, since that cost should occur whether or not a soybean crop is present. In fact, having soybeans on the field may even reduce herbicide costs compared to leaving the field fallow. Still, it is highly recommended to apply a pre-emergence residual herbicide before or at planting time, especially if weed resistance to glyphosate has been a problem. Later in the summer, a healthy soybean canopy may suppress weeds enough that a late-summer post-emergence application may not be needed.

Variety selection for double cropping is important. Soybeans flower in response to a combination of temperature and day length, so shifting to an earlier-maturing variety when planting late in a double crop situation will result in very short plants with pods that are close to the ground. Planting a variety with the same or perhaps even slightly later maturity rating (compared to soybeans planted at a typical planting date) will allow the plant to develop a larger canopy before flowering. Planting a variety that is too much later in maturity, however, increases the risk that the beans may not mature before frost, especially if long periods of drought slow growth. The goal is to maximize the length of the growing season of the crop, so prompt planting after wheat harvest time is critical. The earlier you can plant, the higher the yield potential of the crop if moisture is not a limiting factor.

Fertilizer considerations. Adding some nitrogen (N) to double crop soybeans may be beneficial if the previous wheat yield was high and depleted soil N. A soil test before wheat harvest for N levels is recommended. Use no more than 30 lbs./acre of N. It would be ideal to knife-in the fertilizer. If that is not possible, banding it on the soil surface would be acceptable. Do not apply N in the furrow with soybean seed as severe stand loss can occur.

Seeding rates and row spacing. Recommended seeding rates for double crop soybeans are no different than for soybeans planted at a typical planting date in a given area or cropping system. Still, seeding rate can be slightly increased if soybeans are planted too late in order to increase canopy

development. Narrow row spacing (15-inch or less) has often resulted in a yield advantage compared to 30-inch rows in late plantings. Soybeans planted in narrow rows will canopy over more quickly than in wide rows, which is important when the length of the growing season is shortened. Narrow rows also offer the benefits of increasing early-season light capture, suppressing weeds and reducing erosion. On the other hand, the advantage of planting in wide rows is that the bottom pods will usually be slightly higher off the soil surface to aid harvest. The other consideration is planting equipment. Often no-till planters will handle wheat residue better and place seeds more precisely than drills, although the difference has narrowed in recent years.

What are typical yield expectations for double crop soybeans? It varies considerably depending on moisture and temperature, but yields are usually several bushels less than full-season soybeans. A long-term average of 20 bushels per acre is often mentioned when discussing double crop soybeans in central and northeast Kansas. Rainfall amount and distribution can cause a wide variation in yields from year to year. Double crop soybean yields typically are much better as you move farther southeast in Kansas, often ranging from 20 to 40 bushels per acre.

A new review publication explores the potential yield of double crop soybeans relative to wheat yield and the most limiting factors affecting the yields for double-crop soybeans. The link to this article is: **https://bookstore.ksre.ksu.edu/pubs/MF3461.pdf**

Sorghum

Sorghum is another double crop option. Unlike soybeans, sorghum hybrids for double cropping should be earlier maturing. Sorghum development is primarily driven by accumulation of heat units and the double crop growing season is too short to allow medium-late or late hybrids to mature before the first frost in most of Kansas.

Late-planted sorghum likely will not tiller as much as early plantings and can benefit from slightly higher seeding rates than would be used for sorghum planted at an earlier date. Narrow row spacing is advised, especially if the outlook for rainfall is good.

A key component for estimation of N application rates is the yield potential. This will largely determine the N needs. It is also important to consider potential residual N from the wheat crop. This can be particularly important when wheat yields are lower than expected. In that situation, additional available N may be present in the soil.

Double crop sorghum planted into average or greater-than-average amounts of wheat residue can result in a challenging amount of residue to deal with when planting next year's crop. Nitrogen fertilizer can be tied up by wheat residue, so use application methods to minimize tie-up, such as knifing into the soil below the residue.

Weed control can be important in double crop sorghum. Warm-season annual grasses, such as crabgrass, can reduce double crop sorghum yields. Using a chloroacetamide-and-atrazine pre-emergence product may be key to successful double crop sorghum production.

No-till studies at Hesston documented 4-year average double crop sorghum yields of 75 bushels per acre compared to about 90 bushels per acre for full-season sorghum. A different 10-year study that did not have double crop planting but did compare early- and late-planting dates averaged 73 bushels per acre for May planting vs. 68 bushels per acre for June planting.

Sunflowers

Sunflowers can be a successful double crop option anywhere in the state, provided there is enough moisture at planting time to get a stand. Sunflowers need more moisture than any other crop to germinate and emerge, so the biggest hurdle to sunflower production is getting a successful stand. Once that hurdle is overcome, sunflowers are more drought-tolerant than most crops so the chances of having a yield in any kind of environment are good.

When double cropping sunflowers, producers should use slightly lower seeding rates to reflect the lower yield expectations compared to full-season sunflowers. It is also necessary to use shorter-season hybrids so they bloom and mature before frost.

Weed control can be an issue with double crop sunflowers since herbicide options are limited, especially post-emergence. Thus, controlling weeds prior to sunflower planting is critical and may be complicated by the presence of glyphosate-resistant weeds and pre-plant restrictions with other herbicides. Consequently, double crop sunflowers may be most successful where glyphosate-resistant weeds are not present. Planting Clearfield or Express Sun sunflowers will provide additional post-emergence herbicide options, but ALS-resistant kochia and pigweeds still won't be controlled. Beyond, the product used in Clearfield sunflower, does have activity on small annual grasses as well as broadleaves (except for ALS-resistant biotypes).

Summer annual forages

With mid-July plantings, and where herbicide carryover issues are not a concern, summer annual sorghum-type forages are also a good double crop option. A study planted July 21, 2008 near Holton, when summer rainfall was very favorable, provided yields of 2.5 to 3 tons dry matter/acre for hybrid pearl millet and sudangrass at the low end to 4 to 5 tons dry matter/acre for forage sorghum, BMR forage sorghum, photoperiod sensitive forage sorghum, and sorghum x sudangrass hybrids. Earlier plantings may be able to produce even more tonnage, as long as there is adequate August rainfall.

One challenge with late-planted summer annual forages is getting them to dry down when harvest is delayed until mid- to late-September. Wrapping bales or bagging to make silage are good ways to deal with the higher moisture forage this late in the year.

Corn

Is double crop corn a viable option? Corn is typically not recommended for June or July plantings because yield is usually substantially less than when planted earlier.

Typically, corn planted in mid-July has a difficult time pollinating and seldom receives sufficient heat units to fill grain before frost. This was illustrated in a study at the South Central Experiment Field in 2007 where 100 to 112 RM corn planted in late June yielded only 40 bushels per acre compared to over 130 bushels per acre for an April planting. In Manhattan in 2007, the same hybrids planted on June 25 yielded over 130 bushels per acre, which is certainly acceptable but substantially less than the 150 bushels per acre for earlier plantings.

Very short-season corn hybrids (80 to 95 RM) have the greatest chance of maturing before frost in double crop plantings, but generally have less yield potential than hybrids that are 100 RM or more used for full-season plantings. Short-season hybrids often will set the ear fairly close to the ground,

increasing the difficulty of harvest. Glyphosate-resistant hybrids will make weed control easier with double crop corn, but there may still be problems with late-emerging summer weeds such as pigweeds, velvetleaf, and large crabgrass. Keep in mind that corn is very susceptible to carryover of most residual ALS herbicides used in wheat.

Volunteer wheat control

One of the issues with double cropping often overlooked by producers is the potential for volunteer wheat in the crop following wheat. If volunteer wheat emerges and goes uncontrolled, it can cause serious problems for nearby planted wheat fields in the fall.

Volunteer wheat can generally be controlled fairly well with glyphosate in Roundup Ready crops. It can also be controlled in sunflowers and soybeans with the labeled post-emergence grass herbicides such as Assure II, Select, or Poast Plus, but control is reduced during times of drought stress. Atrazine can provide control of volunteer wheat in corn and sorghum, but can be erratic depending on rainfall patterns.

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5. Just how much rain qualifies as a toad-strangler?

Have you heard the term "Toad-strangler"? For those unfamiliar with the phrase, it means a very heavy rain – enough to strangle a toad. That picturesque phrase very nicely captures the deluge of rain experienced throughout much of eastern and central Kansas on Friday, May 15. The Kansas Mesonet station at Parsons reported 4.70 inches on the May 15, 2020. Seven other weather stations, including CoCoRaHS and NWS Coop stations reported over 3 inches for the date

While the Parsons total was well above the 95-year average single-day rain of 3.58", it is not the largest amount of rain received. The highest 1-day rainfall total for Parsons was 7.48" of rain received on June 22, 1948 (Figure 1). Other stations in the Southeast Division received even more that day, with the greatest amount reported at Altamont at 10.55 inches. That year Parsons had total rainfall of 44.45", just slightly above the 95-year average of 41.5". The Southeast Divisional average for that year was 40.13".

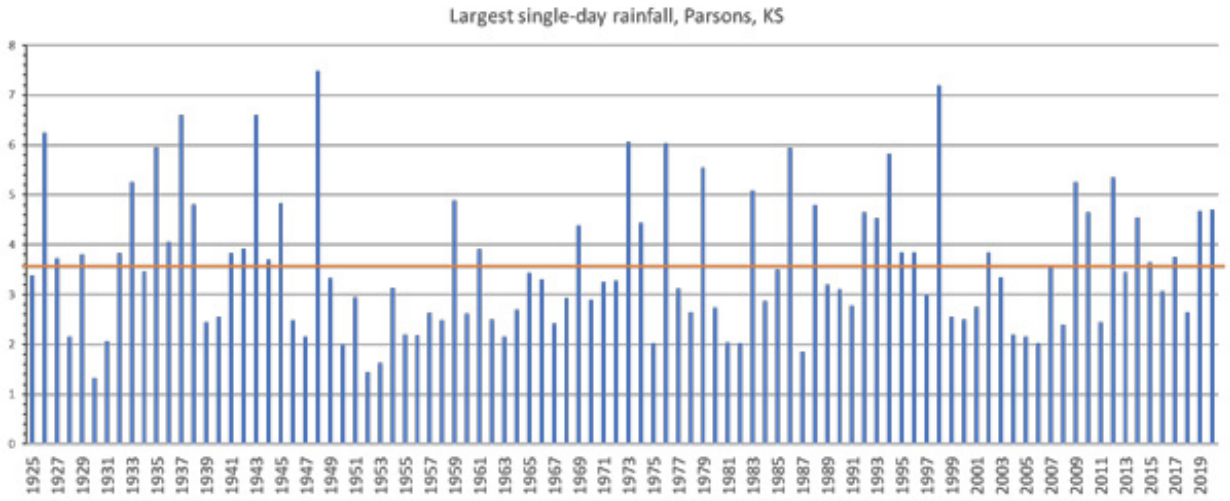

Figure 1. Greatest daily rainfall totals at Parsons. The orange line is the average single-day rainfall maximum at 3.58".

Reviewing records from currently active stations, the largest daily rainfall total on record occurred at Fort Scott (Figure 2). They reported 12.50" on September 15, 1998. While the summer months have the largest monthly totals and the most extreme rain events, of the 957 currently active stations, 242 have their record rainfall days in the fall (September - November). In many cases, the large rainfall totals come from a highly localized storm with very little movement. While the highest single-day rainfall total roughly follows the average annual precipitation pattern, stations in central and northern portions of Kansas also receive high rain events.

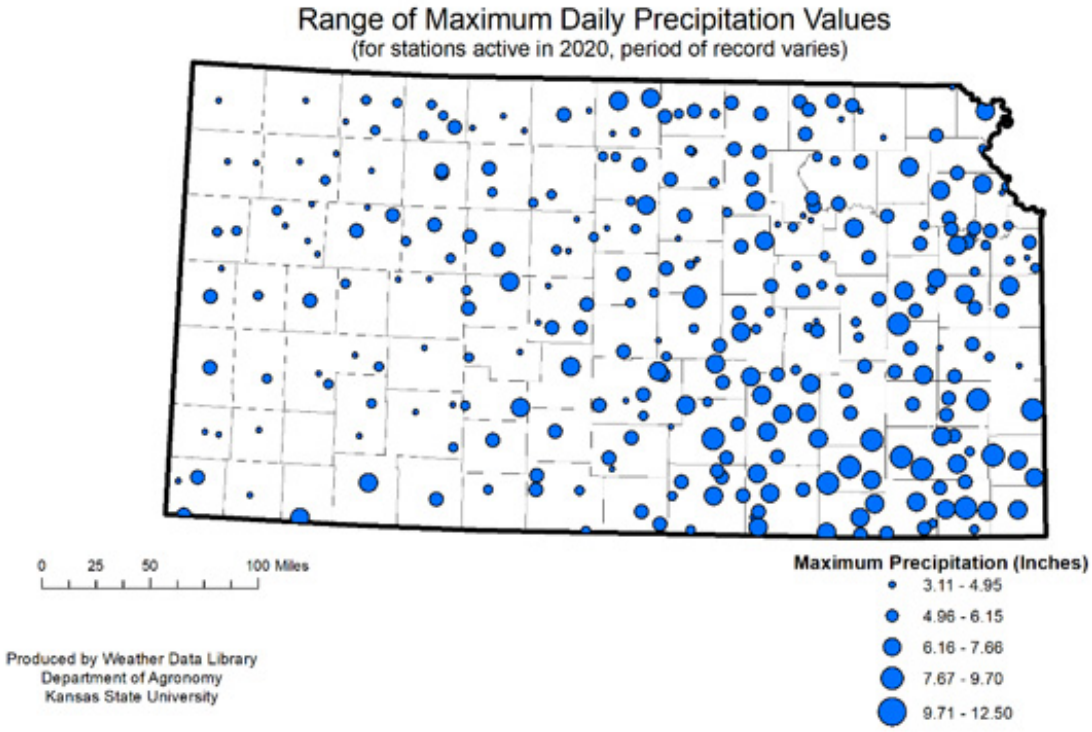

Figure 2. Maximum daily precipitation values. Source: Kansas Weather Data Library.

Unfortunately, while these intense rain events create their own problem, they do not tell the whole story. A heavy rain event might produce localized flash flooding, but the waters usually recede quickly. If the events are part of an overall wet pattern, runoff may be greater and the flooding will persist longer.

Soil moisture is one of the factors that affects water infiltration into the soil. Dry soils will have a faster infiltration rate at first, which slows as soil pores become occupied by water. Soil texture, at the surface and in horizons below the surface, also affects infiltration rate, as does management. Crop residue protects the soil surface from the impact of raindrops and can help keep the soil from crusting off. Intense rain events can quickly exceed a soils infiltration capacity, as well as move soil at the surface sealing off macropores leading to greater amounts of runoff. Residue management, cover crops and no-tillage are recommended best management practices that protect the soil surface and reduce the amount of sediment lost as water runs off (Figure 3). Current streamflow levels are high in the eastern areas of the state (Figure 4). Little additional rainfall would be needed to produce more widespread and persistent flooding.

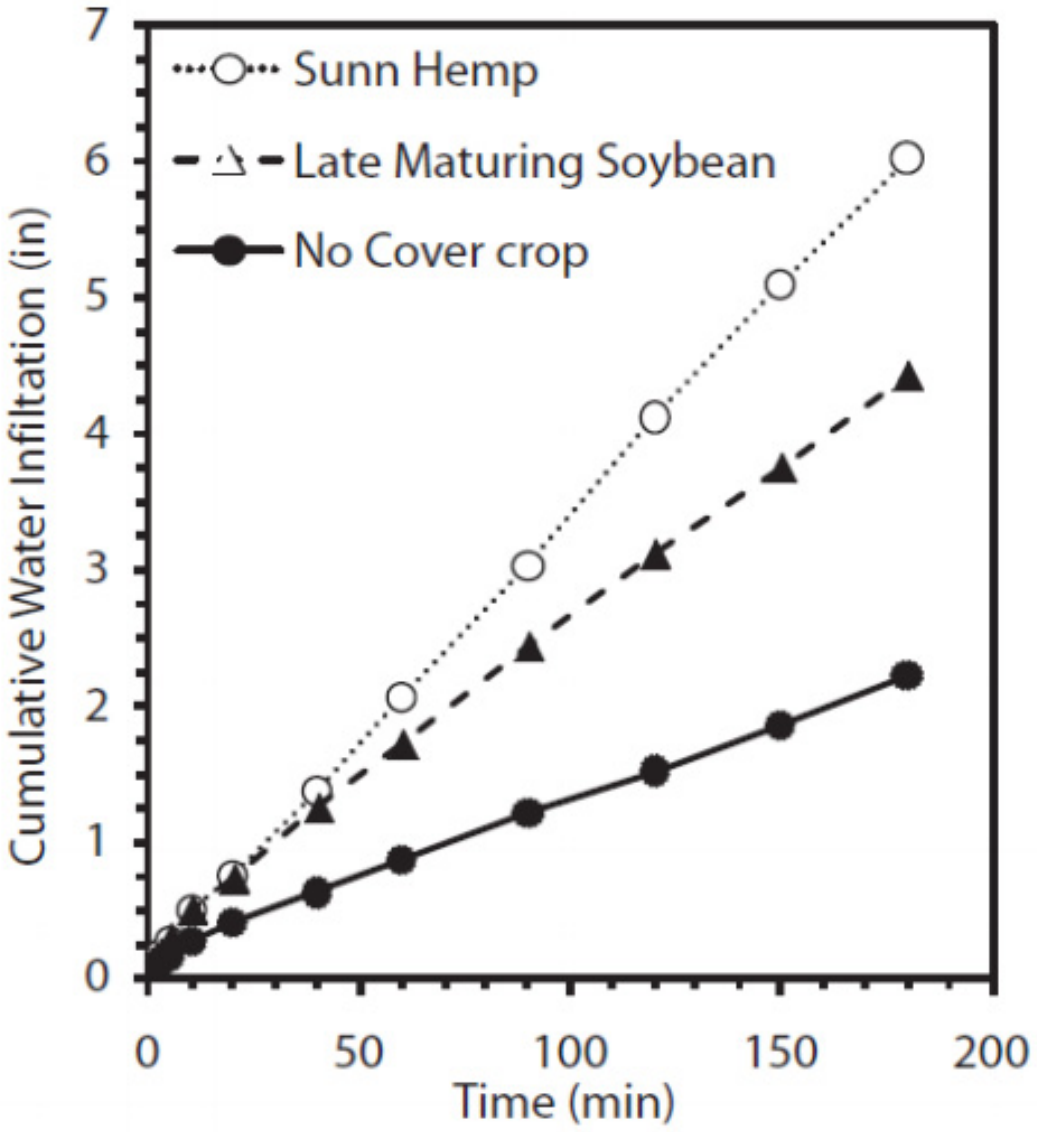

Figure 3. Adding cover crops to a no-tilled wheat-grain sorghum led to increased ponded infiltration rates. This was measured 15 years after the study started. Adapted from Blanco-Canqui, H., Claassen, M. M., & Presley, D. R. (2012). Summer cover crops fix nitrogen, increase crop yield and improve soil-crop relationships. Agronomy Journal, 104(1), 137-147.

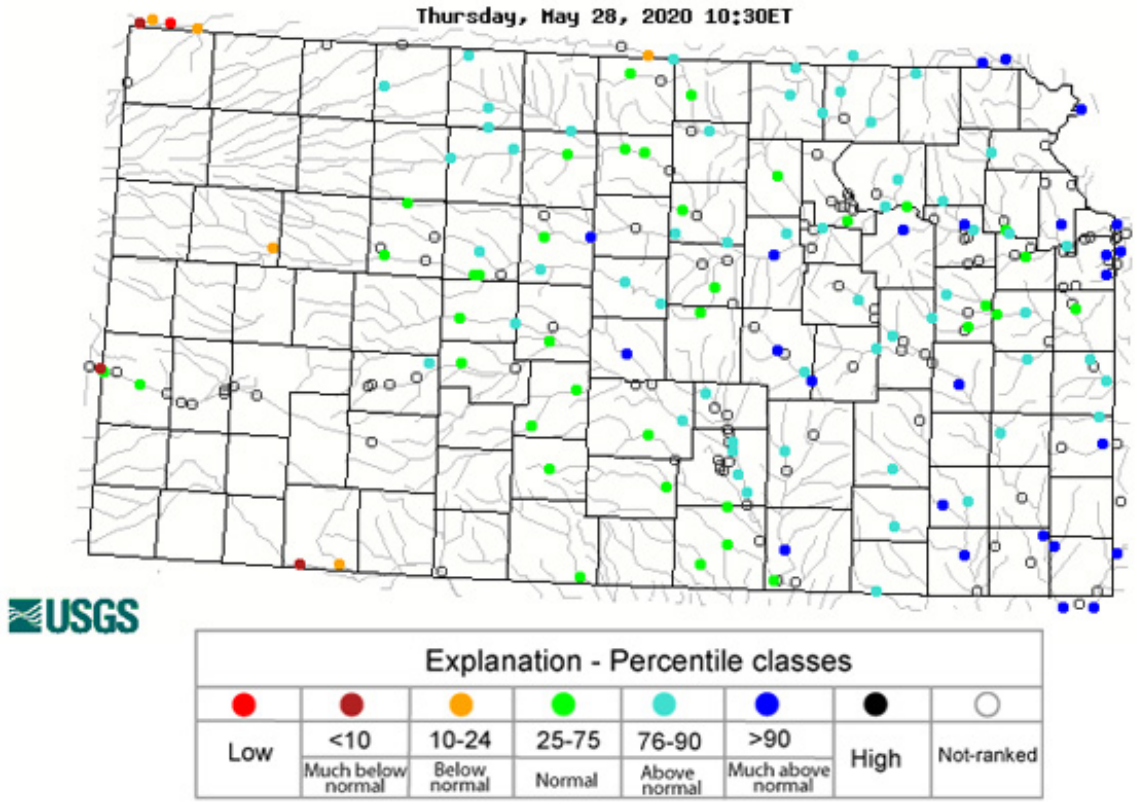

Figure 4. Current river levels in Kansas. Source: USGS

The Southeast Division continues with very high rainfall in 2020, with the 10th wettest start to the year since 1895. With the accumulation through Thursday, May 28, Parsons has the wettest start to the year since 1925 (Figure 5).

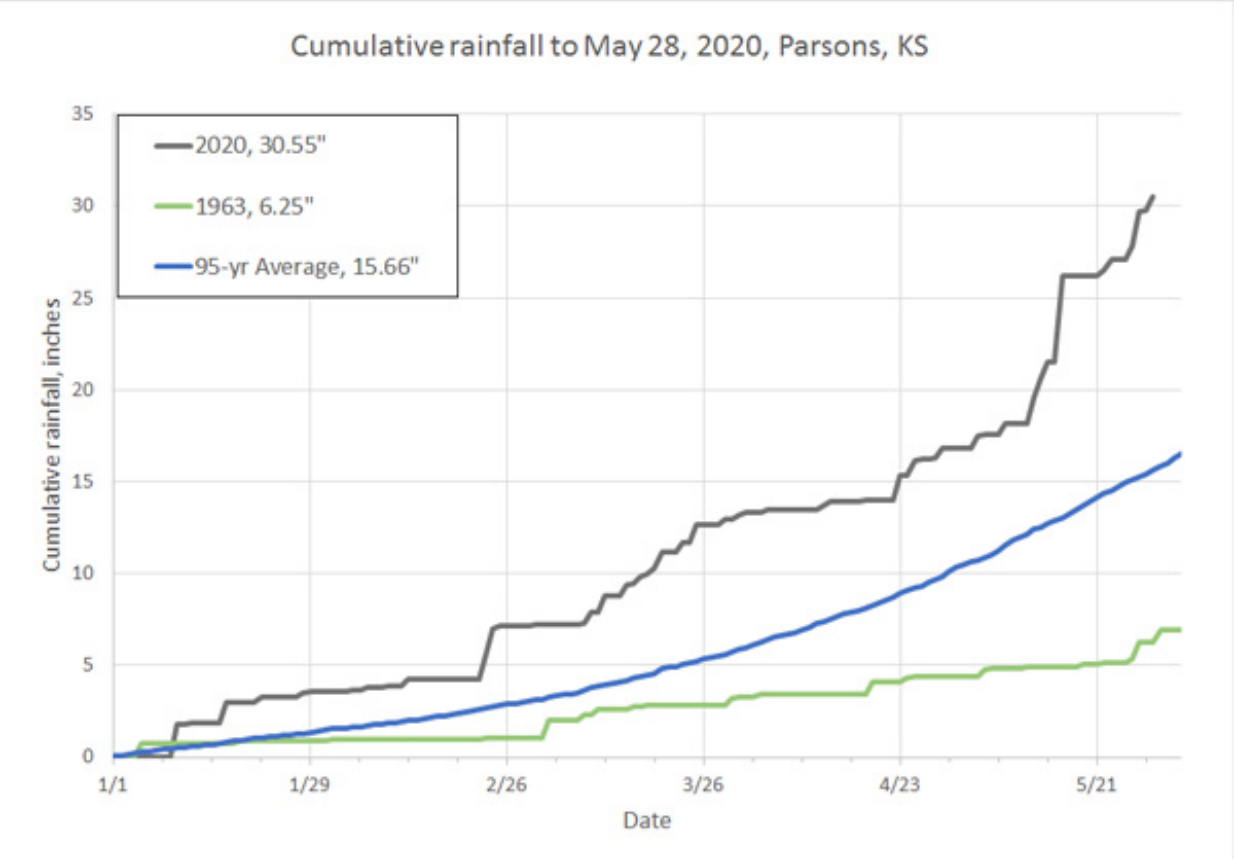

Figure 5. Cumulative precipitation at Parsons. Graph created by Gretchen Sassenrath, K-State Research and Extension.

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6. Upcoming warm weather may slow down stripe rust spread

Stripe rust distribution update

Stripe rust has continued to show up in Kansas, with additional observations made in the western portion of the state (Figure 1). It should be noted that although stripe rust was observed on flag leaves, incidence remains very low in many locations. As stripe rust infections favor cool weather, the warmer days forecasted over the next week should help mitigate the risk of major spread. Wheat in Kansas ranges currently ranges from heading to well into the grain fill period.

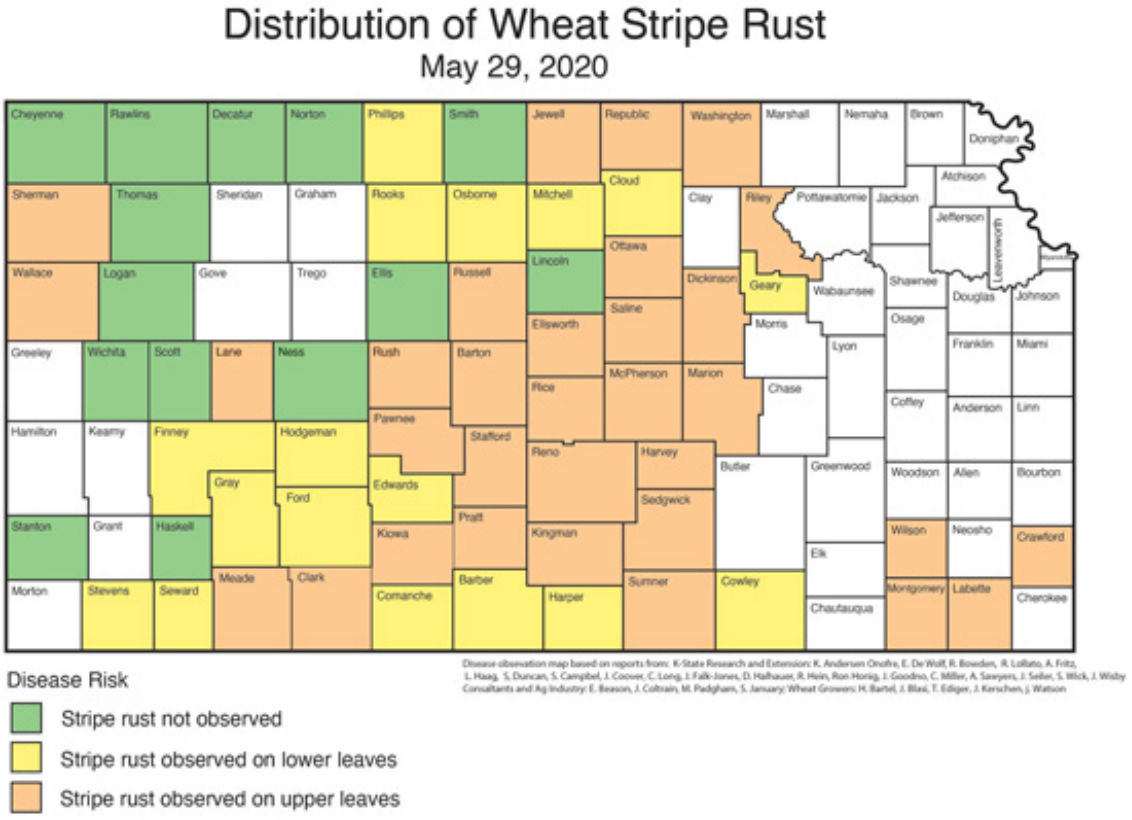

Figure 1. Distribution of stripe rust in Kansas as of May 29, 2020. Map is based on observations of K-State Research and Extension, crop consultants, and wheat producers in the state. Map created by Kelsey Andersen Onofre and Erick DeWolf, K-State Research and Extension.

Evaluating the need for fungicide applications

As we have mentioned in previous eUpdate articles, many fungicides labeled to manage wheat diseases cannot be applied after Feekes 10.5.4 or within the 30-day window prior to harvest (https://bookstore.ksre.ksu.edu/pubs/EP130.pdf). This will be important to remember as wheat in Kansas moves into those final stages of crop development. Research done at K-State suggests that

the average yield response to a foliar fungicide on a susceptible variety in a high disease pressure situation is about 10%. The yield response for stripe rust can be more than 20% when conditions favor disease development on susceptible varieties, and stripe rust has been detected on the flag leaves. Using this figure along with estimates of a field's yield potential and the value of wheat grain, we can quickly estimate the breakeven point for a fungicide application (taking into consideration the cost of the product and application per acre, expected bu/acre return, and the price of grain).

In general, fields with more than a 40 bu/acre yield potential are good candidates for a fungicide application when conditions are favorable for disease. Fields that have been heavily damaged by virus infection or freeze damage may not meet the economic yield threshold for an application.

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