Issue 818

K-STATE
Research and Extension

Extension Agronomy

eUpdate

09/11/2020

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 | 09/11/2020 | Issue 818

1. Planting wheat too early can lead to several problems

The general target date for planting wheat for optimum grain yields in Kansas is within a week of the best pest management planting date, or BPMP (formerly known as the "Hessian fly-free") date (Figure 1). If forage production is the primary goal, earlier planting (mid-September) can increase forage yield. However, if grain yield is the primary goal, then waiting until the BPMP date to start planting is the best approach (Figure 2). Planting in mid-September is ideal for dual-purpose wheat systems where forage yields need to be maximized while reducing the effects of early planting on reduced grain yields.

Optimum wheat planting dates in Kansas depend on location within the state. Suggested planting dates by zone are as follows:

Zone 1: September 10-30

Zone 2: September 15 – October 20

Zone 3: September 25 – October 20

Zone 4: October 5 – 25

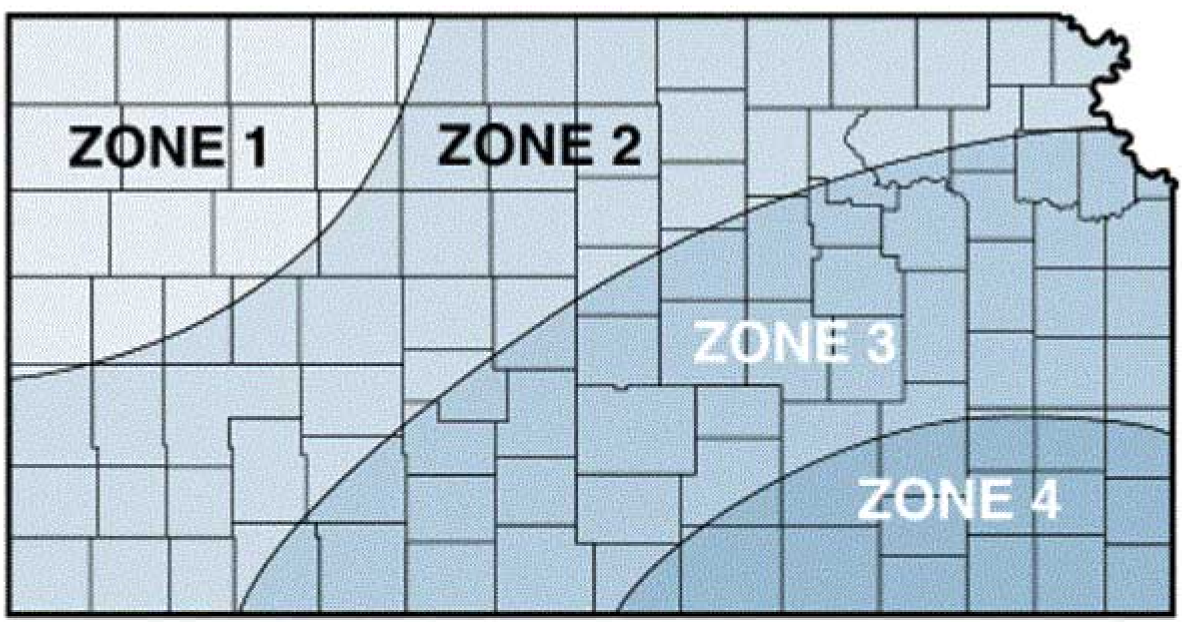

Figure 1. Optimum wheat planting dates by zone in Kansas.

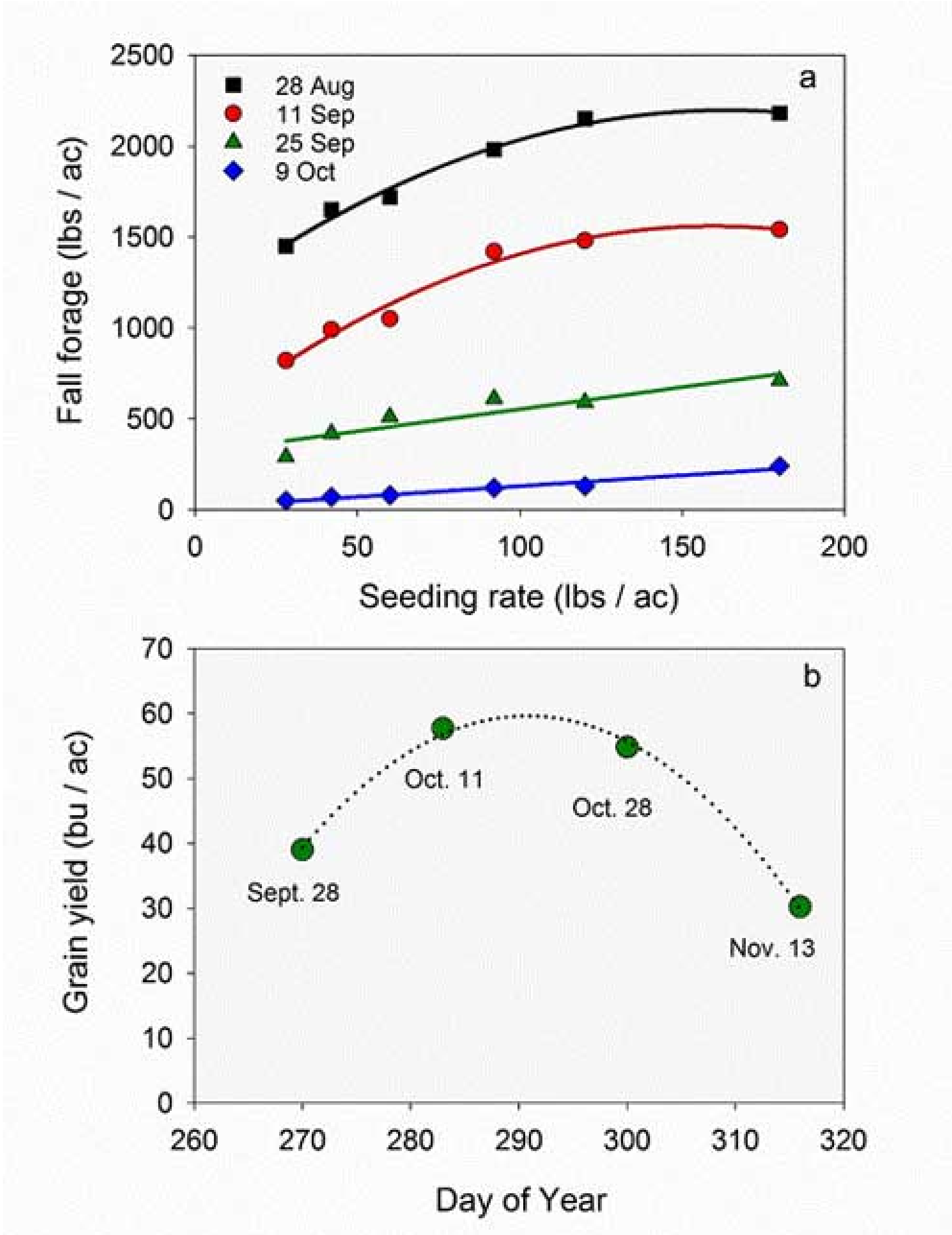

Figure 2. Effect of planting date and seeding rate on wheat fall forage yield in Lahoma, north-central Oklahoma (a) and effect of planting date on wheat grain yield near Hutchinson, south-central Kansas (b). Figure adapted from KSRE numbered publication MF3375.

While the effects of planting date on wheat yield shown in Figure 2 will hold true for most years, they will largely depend on environmental conditions and disease pressure during the growing season. In some years, earlier-planted wheat does best and some years the later-planted wheat does best, and these year-specific performances usually relate to the weather experienced in the fall and spring. For instance, early-planted fields in growing seasons with a warm fall might produce excessive biomass that will use water during the fall. If the following spring is dry, soil water deficit during grain filling then can reduce grain yield. Conversely, a warm fall would favor tillering of a later-planted wheat crop, helping to compensate for this delay. The opposite is also true: in years with an early onset of cold temperatures during the fall, an earlier planted crop might perform better than a later planted crop due to its ability to produce enough fall tillers to still maximize grain yield.

In dry years, seedling emergence and stand establishment can be uneven. These dry conditions can also lead to poor crown root development and fall tillering. If fields become too wet to plant by mid-October and stay that way through the remainder of the fall, then producers end up planting much later than the optimum planting date. Following an unusual year, producers will often start planting earlier than the recommended date if soil conditions are good, because the negative consequences of adverse conditions are fresh on their minds. However, planting early also increases the risk of other production problems including multiple diseases, insect pests, weed infestations and undesirable growth of the crop.

Potential risks of planting wheat early

Increased risk of **wheat streak mosaic and related diseases**. Wheat curl mites that spread these diseases survive the summer on volunteer wheat and certain other grasses. As those plants die off, the wheat curl mites leave in search of new plants to feed on. Early-planted wheat is likely to become infested, and thus become infected with wheat streak mosaic virus, high plains virus, and Triticum mosaic virus. The wheat curl mites are moved by wind and can be carried a mile or more before dying, so if wheat is planted early, make sure all volunteer wheat within a mile is completely dead at least two weeks before planting. For growers considering planting early, a good management consideration would be to select wheat varieties with resistance to the wheat streak mosaic virus and/or with tolerance to the wheat curl mite, especially in the western portions of the state.

Increased risk of **Hessian fly**. Over the summer, Hessian fly pupae live in the old crowns of wheat residue. After the first good soaking rain in late summer or early fall, these pupae (or "flaxseed") will hatch out as adult Hessian flies and start looking for live wheat plants to lay eggs on. They are most likely to find either volunteer wheat or early-planted wheat at that time. After the BPMP date, many of the adult Hessian fly in a given area will have laid their eggs, so there is generally less risk of Hessian fly infestation for wheat planted after that date. Hessian fly adult activity has been noted through November or even early December in Kansas. If planting early, consider varieties with improved tolerance to Hessian fly.

Increased risk of **barley yellow dwarf**. Many types of aphids can spread barley yellow dwarf. In Kansas, greenbugs and bird cherry-oat aphids are the primary vectors of this viral disease. These insects are more likely to infest wheat during warm weather early in the fall than during cooler weather. Planting wheat after the BPMD reduces the risk of problems with aphids and barley yellow dwarf. If planting early, consider varieties with improved tolerance to Barley Yellow Dwarf virus, especially in central and eastern Kansas or consider the use of seed treatments with imidacloprid (such as Gaucho XT or Rancona Crest).

Increased risk of **excessive fall growth and excessive fall tillering**. For optimum grain yields and winter survival, the goal is for wheat plants to go into winter with established crown roots and 3-5 tillers. Wheat that is planted early can grow much more than this, especially if moisture and nitrogen levels are good. If wheat gets too lush in the fall, it can use up too much soil moisture in unproductive vegetative growth. These fields are often experience more drought stress in the spring if soil conditions remain dry.

Increased risk of **take-all, dryland foot rot, and common root rot**. Take-all is usually worse on early-planted wheat than on later-planted wheat. In addition, one of the ways to avoid dryland foot rot

(*Fusarium graminearum* and other *Fusarium* species) is to avoid early seeding. This practice promotes large plants that more often become water stressed in the fall predisposing them to invasion by the fungi. Early planting of wheat also favors common root rot because this gives the root rot fungi more time to invade and colonize root and crown tissue in the fall. Seed treatments are an option to early season seedling diseases. More information: https://bookstore.ksre.ksu.edu/pubs/MF2955.pdf

Grassy weed infestations become more expensive to control. If cheatgrass, downy brome, Japanese brome, or annual rye come up before the wheat is planted, they can be controlled with glyphosate or tillage. If wheat is planted early and these grassy weeds come up after the wheat has emerged, producers will have to use an appropriate grass herbicide to control them.

Germination problems due to high soil temperatures. Early planted wheat is sown in hotter soils, which may become problematic because some wheat varieties are sensitive to high-temperature during germination. In fact, some varieties will not germinate when soil temperatures are greater than 85°F. If planting early, it is important to select varieties that do not have high-temperature germination sensitivity or sow sensitive varieties later in the fall, when soil temperatures have cooled down.

Emergence problems due to shortened coleoptile length. Hotter soils tend to decrease the coleoptile length of the germinating wheat. Therefore, deeply planted wheat may not have long-enough coleoptiles to break through the soil surface resulting in decreased emergence and poor stand establishment. When soil temperatures are hot, it is often better plant wheat at a shallower depth (3/4 to 1 inch deep) even if moisture is absent in the top layers of soil. Planting wheat deep (>2 inches) increases the risk of poor emergence and unacceptable stands.

Summary

Early sowing of wheat can lead to several problems, from increased chances of insect- or mite-transmitted viral diseases to decreased emergence due to high temperatures and its consequences on wheat germination of particular varieties and reduced coleoptile length. Ideally, growers would consider planting around the optimum window; but, if planting early due to moisture availability or a dual-purpose system, growers should consider selecting wheat varieties with tolerance to the major yield-reducing factors in their respective region. Growers should strongly consider a seed treatment with both fungicides and insecticides if planting wheat early in Kansas.

Kelsey Andersen Onofre, Extension Wheat Pathologist
andersenk@ksu.edu

Erick DeWolf, Wheat Pathologist
dewolf1@ksu.edu

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

Jeff Whitworth, Extension Entomologist

jwhitwor@ksu.edu

2. Wheat planting - Seed treatments are strongly encouraged this season

As we move into wheat planting season here in Kansas, seed treatments are strongly advised for seed that is being saved from previous seasons. During the 2019-2020 season, we saw higher-than-normal levels of common bunt and loose smut throughout the state. Common bunt, in particular, can result in both yield and quality loss. Many producers received discounts on their wheat after the 2020 harvest. Fungicide seed treatments are an important tool to avoid even larger losses in the 2020-2021 growing season.

Low quality wheat can result not only in losses for individual producers, but can also dramatically reduce the quality of grain destined for the market. "These diseases have market implications", said Aaron Harries, V.P. of research and operations for Kansas Wheat. "There were instances this past harvest of farmers receiving discounts at their local elevator because of bunt and smut problems."

The good news is that common bunt and loose smut are very effectively controlled with the use of seed treatments. In particular, we recommend products that have at least the active ingredient difenoconazole (Trade Names: Cruiser Maxx Vibrance Cereals, Vibrance Extreme, Salient TMI, and Dividend Extreme).

For more information about common bunt and maximizing the efficacy of seed treatments, check out this 2020 Kansas State Research and Extension YouTube video:

https://www.youtube.com/watch?v=Cg-fpllsjW4

Kelsey Andersen Onofre, Extension Plant Pathologist
andersenk@ksu.edu

Erick De Wolf, Plant Pathologist
dewolf1@ksu.edu

3. Wheat planting - Tips for good stand establishment

Regardless of the soil moisture conditions at wheat planting time, there are a few important steps producers can take to improve their chances of getting a good stand of wheat.

Proper tractor speed. It is best to use a tractor speed of between 5 and 6 miles per hour in most cases when drilling wheat, depending on the amount of down pressure on the openers. If higher speeds are used, the openers can tend to "ride up" in the soil every now and then if down pressure is insufficient.

Proper, uniform seeding depth. The ideal planting depth for wheat in most cases is about 1.5 inches. When planting early into very warm soils, it is especially important not to plant too deeply since coleoptile lengths are shorter than normal under warm conditions. On the other extreme, producers should also be especially careful not to plant too deeply when planting later than the recommended time into very cool soils. Getting a uniform seeding depth is also important. Where producers are planting into fields with heavy residue, or where there is uneven distribution of chaff from the previous crop, uneven planting depth can be a serious problem. In those situations, it is common to end up with poor stand establishment in areas of the field where the drill opener rode up over the residue or chaff, and was unable to penetrate the soil to the same depth as in other areas of the field.

Firm seedbed. Planting into loose, fluffy soils can be a problem where soils have been tilled repeatedly during the summer. When seeds are planted into loose soils, rains in the fall will settle the soil and leave the crowns of the seedlings too close to the soil surface. Having a good closing system behind the drill openers, with adequate down pressure, should help.

Plant during the optimum window. In general, wheat should be planted somewhere around the Hessian fly-free date. There may be good reasons to plant some wheat before the fly-free date, such as planting for pasture or time pressures from having considerable acreage to plant. But stand establishment and ultimate grain yields are usually best when wheat is planted after the best pest management planting date (BPMP, former Hessian fly-free date) and before deadlines set by crop insurance. Planting more than three weeks after the BPMP can be risky. Late-planted wheat often does not develop an adequate root system before winter, and forms fewer productive fall tillers. When planting late, seeding rates should be increased by 25 to 50 percent to help ensure an adequate stand and compensate for the lack of tillering. See the accompanying article about the risks of planting wheat too early.

Adequate soil fertility. In general, producers should apply at least part of their nitrogen before or at planting time to get the plants off to a strong start. Nitrogen rates of 20-30 lbs can help with fall establishment and tillering. If the soil is low or very low in phosphorus or potassium, these nutrients should be applied at planting time as well so that the plants benefit early in their development. Starter phosphorus with the seed or band-applied close to the seed can also help with fall early growth and establishment, particularly in low-testing soils. Low soil pH can be a concern particularly early in the season when root systems are mostly near the surface, which is often an area of lower pH. Soil tests will determine the need for pH adjustment, and potential for aluminum toxicity. Variety selection and phosphorus application with the seed are potential management strategies for low pH and aluminum toxicity issues if it is too late to apply lime before seeding.

Make adjustments for planting into row crop stubble. When planting wheat into grain sorghum stubble, producers will need an extra 30 lbs N per acre over their normal N rate. Also, it is important to make sure the sorghum is dead before planting wheat. When planting wheat into soybean stubble, producers should not reduce their N rates since the N credit from soybeans doesn't take effect until the following spring. If the wheat is being planted no-till after row crop harvest, N rates should be increased by 20 lbs N per acre over the normal N rate. Seeding rates should be increased when planting wheat late after row crop harvest. It's best to use a seeding rate of 90 to 120 lbs per acre in central and eastern Kansas, and 75 to 100 lbs per acre in western Kansas. When planting more than three weeks after the BPMP date, producers should use a seeding rate of 120 lbs per acre.

Watch out for potential disease issues when planting into corn residue. The risk of some diseases may be higher when wheat is planted into fields with large amounts of corn residue left on the soil surface. Fusarium head blight (scab) of wheat, for example, is caused by a fungus that is known to cause a stalk rot of corn.

Using a seed treatment. Seed treatments can at times act as an insurance, helping avoid seed-born and early-season fungal diseases. Check out a previous eUpdate article on seed treatments for wheat disease management at https://bit.ly/3iF1nAW

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

4. Corn production issues - Droopy ears

Several corn farmers have been recently reporting issues as the crop is approaching maturity. One of the main issues is about the premature ear droop observed in several fields across the state. Corn plants typically maintain the ears in the upright position until after the crop has reached full maturity (black layer - around 35% grain moisture in the kernels). This process occurs due to the loss of turgidity in the shank that supports the ear (Figure 1). This condition observed in several fields across the state is a reflection that the movement of sugars and nutrients from the plant to the ear has been impaired and therefore grain filling is usually interrupted.

Figure 1. Droopy ears observed in a corn field and a picture of the ear depicting kernels early in the grain filling process. Photos by Marvin Pipes.

The main consequence of this phenomenon is that all kernels in the ear will move prematurely to black layer formation (maturity) (Figure 2). This issue will have a larger impact on yield depending on the stage of the grain filling – with earlier occurrences during the grain filling presenting a larger impact on final yields, primarily by affecting the final kernel size.

Factors that influence droopy ears

Some of the conditions that favor this issue are related to: high temperatures, poor root development, and drought stress – with the latter as one of the most relevant factors in past seasons. However, it does not appear that drought was the main cause for this season since this issue has also being reported in many irrigated fields (with water being not a limiting factor). At this point, we are still exploring different hypotheses for main causes, but one thing is certain, the loss of turgidity in the shank is linked to a cannibalization of carbohydrates for the plant. Simply put, the plant (more specifically, the kernels) were running out of resources. When this occurs, the plant will use all the reservoirs of carbohydrates available – with the stem and shank organs as main plant storage units – until running out of sugars to satisfy the grain-filling demand.

A few factors that can affect the ability of the plant to produce less carbohydrates (and also have a low reservoir) are linked to the photosynthesis process. Optimal temperature, solar radiation, adequate water, and nutrition are key components for healthy plants and good conditions for improving the ability to produce carbohydrates. Many factors are still under evaluation. Based on our current analysis, there is clearly a combination of multiple stresses (less optimal temperatures, cloudy days, and high evapotranspiration) affecting photosynthesis and thus the capability of the corn plants to satisfy the demand coming from all the kernels in the ear.

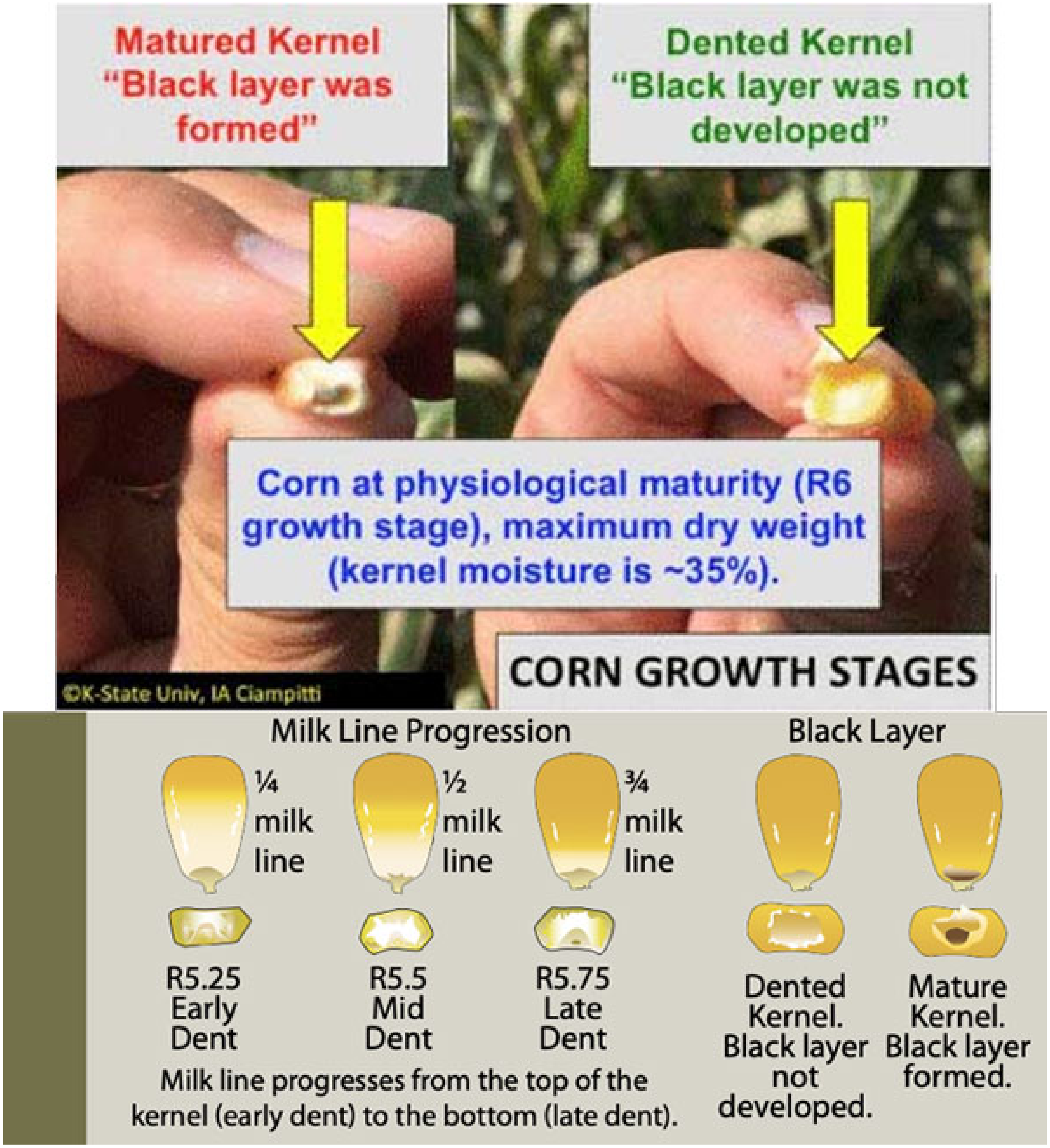

Figure 2. Corn at dent and black layer growth stages (upper panel) and progression of "milk line" for corn (lower panel; source: https://bookstore.ksre.ksu.edu/pubs/MF3305.pdf). Photo and infographic by Ignacio Ciampitti, K-State Research and Extension.

What is the impact on final yield?

Yield impact will depend on the timing of stress. From early dent stage to physiological maturity, the overall duration of grain filling is around 33 days (depending on environmental and plant factors; Table 1).

- If the stress takes place early during the dent stage (R5 stage), the final dry matter in the kernel is only at about 45% (kernels with 60% moisture).
- If the stress occurs a week after the onset of dent stage (R5.25 stage), the kernel moisture is usually at around 50%, with + 30% of dry matter still to be accumulated until maturity.
- If the stress occurs at mid-point of dent stage (1-2 weeks after early dent; R5.5 stage) or late dent (2-3 weeks after early dent; R5.75), then the overall impact on dry matter accumulation until maturity will be relatively small, ranging from 3-10%.

			Average per Substage	
R Stage	Moisture %	Dry Matter (% of Total Dry Weight)	Growing Degree Days, °F	Days
5.0	60	45	75	3
5.25 (¼ milk line)	52	65	120	6
5.5 (½ milk line)	40	90	175	10
5.75 (¾ milk line)	37	97	205	14
6.0 (Physiological maturity)	35	100		

[1]Abendroth, L.J., R.W. Elmore, M.J. Boyer, and S. K. Marlay. 2011. *Corn Growth and Development*. PMR 1009. Iowa State Univ. Extension. Ames Iowa.

Table 1. Growth stages, moisture content, and total dry matter progression for corn from late to physiological maturity. Table from K-State Research and Extension publication MF3305 (Ciampitti, Elmore, Lauer, 2016).

The timing of stress impacts the final accumulation of dry matter, affecting kernel size. Common values range of kernels per bushel range from 75,000 to 80,000 for favorable, 85,000 to 90,000 for average, and 95,000 to 105,000 for poor grain filling conditions. An example of the potential impacts for extreme cases (average vs. favorable filling) is presented below, but these estimations depend on the total number of ears affected by this issue.

Example:

Ears per acre: (30-inch rows), 24,000 ears per acre

Kernels per ear = 650 kernels;

Kernels per acre = 15,600,000 kernels per acre

Kernels per bushel:

- Average filling = 15,600,000 kernels per acre ÷ 90,000 kernels per bushel = 173 bu/acre
- Favorable filling = 15,600,000 kernels per acre ÷ 80,000 kernels per bushel = 195 bu/acre

At this point, scouting fields will be important in order to check for the integrity of the ear shanks and to explore potential issues affecting harvest operations (e.g., presence of ears on the ground).

Ignacio A. Ciampitti, Crop Production and Cropping Systems Specialist
ciampitti@ksu.edu

5. Effect of low temperatures on summer row crops

Extreme low temperatures were recorded in western Kansas this week (Figure 1). For all summer crops, these killing temperatures will end development. At this point, corn is near maturity and the potential impacts of lower temperatures will have little or no impact on expected corn yields (depending on the absolute value, the duration of the stress, and phenology of the crop). The main challenges will be for soybeans in the coming weeks during the final reproductive stage, with the potential of impacting final seed weight (either affecting the rate of accumulation of dry matter on the seeds or by interrupting this process) where temperatures dropped below 32 degrees F.

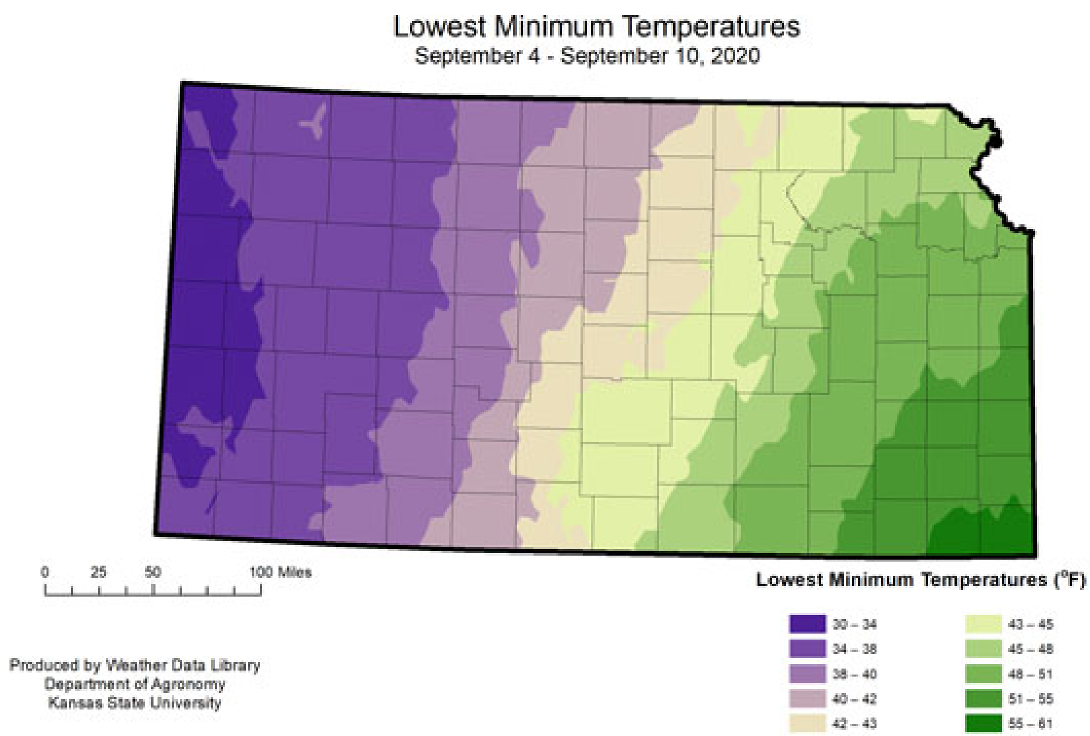

Figure 1. Lowest Minimum Temperatures for week ending 10-Sep-2020 (Kansas Mesonet).

Sorghum

Wet conditions delayed sorghum planting in some areas of the state thus delaying heading. During August, cooler-than-normal temperatures dominated the state, followed by a warmer-than-normal September. A delay in flowering time could jeopardize yields if the crop is exposed to heat around blooming or if low temperatures occur during grain fill. The long-season growing-degree-day (GDD) accumulation from September 1 – October 10 portrays a lower GDD accumulation for the north central and eastern parts of the state (Figure 2). The largest departure of GDD accumulation was recorded in the south central, southeastern, and northeast-north central portions of the state (Figure

3).

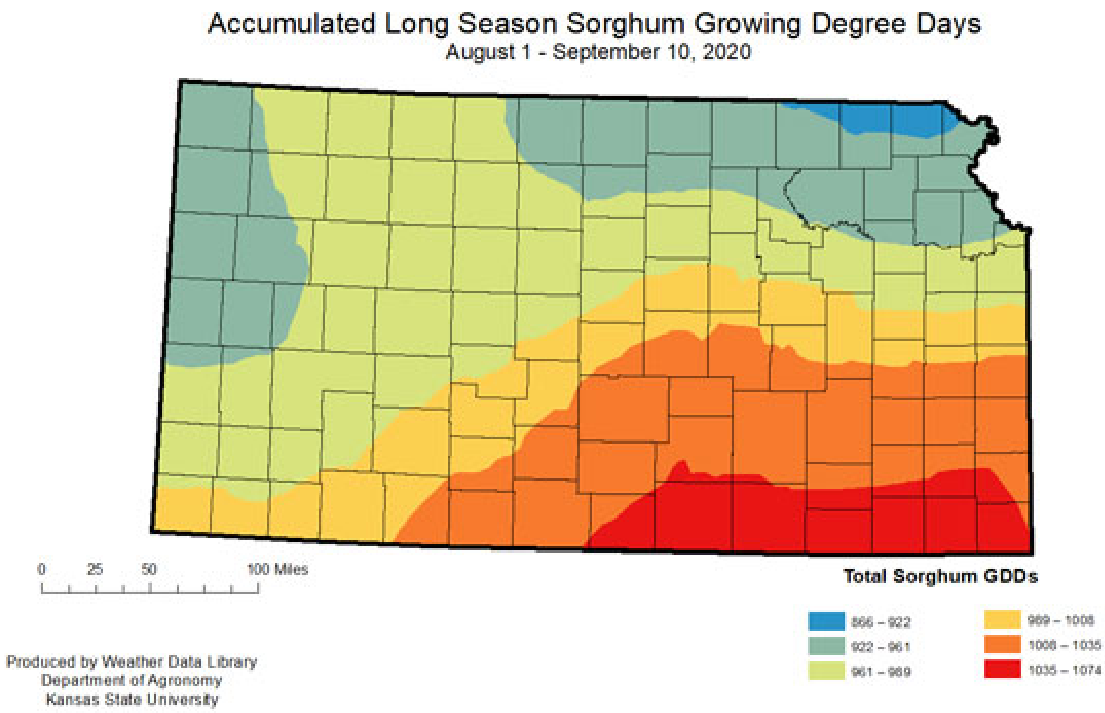

Figure 2. Accumulated Long Season Sorghum Growing Degree Days.

Low temperatures will reduce seed growth and affect final test weight and seed quality. Temperatures below 40 degrees F will inhibit growth. A freeze will kill sorghum if the stalks are frozen, impairing the flow of assimilates and nutrients to the grain. A freeze at the hard-dough stage (before grain matures) will produce lower weight and chaffy seeds.

The likelihood of sorghum maturing before a freeze is related to the following factors (as affected by weather and hybrid):

- planting date,
- plant growth rate during the season, and
- date of half-bloom.

When the crop flowers in late August or early September, it may not reach maturity before the first fall freeze in some parts of the state. For the northwest, western, and north central areas, any sorghum that has not reached maturity will not.

Corn

Temperatures below 32 degrees F can produce equivalent or greater damage even when the exposure time is relatively short. Clear skies, low humidity, and calm wind conditions increase freeze damage even with temperatures above 32 degrees F. Any freeze damage at this point in the season will hardly produce any visible symptoms, but can affect the final test weight and potentially seed quality - depending on the growth stage. Corn is not affected by freeze once it reaches the black layer stage.

Soybeans

Temperatures below 32 degrees can interrupt grain filling and impact yield, meaning lower test weight and seed quality. Necrosis of the leaf canopy is a visible symptom of freeze damage. Absolute temperature is more important than the duration of the cold stress – especially if temperatures drop below 28 degrees F. As the crop approaches maturity, the impact of a freeze event on yields declines.

Ignacio Ciampitti, Cropping Systems Specialist
ciampitti@ksu.edu

Mary Knapp, Weather Data Library
mknapp@ksu.edu

6. Grain sorghum yield potential: Understanding the main yield components

In order to best estimate the yield potential of grain sorghum, we need to understand the main plant components of sorghum yield. The main yield-driving factors are:

- number of plants,
- number of tillers per plant,
- total number of seeds per head, and
- seeds per pound.

The number of plants and the number of tillers per plant are two of the main components and are determined well before the end of the growing season. The initial plant density, planting date, and the environment, among other factors, influence those two yield components. To learn more about an on-farm approach for calculating sorghum grain yield potential before harvest, please see the companion eUpdate article in this issue, "Grain sorghum yield potential: An on-farm calculation".

Understanding sorghum yield components

Increasing the number of plants per acre potentially increases competition for resources, which can diminish the plant's capacity to produce tillers. In addition, the interaction of planting date with plant density can have a similar effect. As planting date is delayed, the capacity of the plant to produce tillers will be reduced; thus, plant population needs to be increased to compensate for the reduction in the number of tillers. Previous research at K-State showed sorghum produces more tillers when planted early (mid-to-late May) at lower plant populations as compared with late planting dates (mid-to-late June).

The environment also plays an important role in the final number of heads per unit area. Heat and drought stress will reduce the plant's ability to produce more tillers and could severely reduce the tiller survival rate. The total number of seeds per head will be determined within the one- or two-week period before flowering until milk to soft dough stages (approximately two to three weeks after flowering).

Seed size will be determined close to the end of the season. In the 15 to 25 days after flowering, during the soft dough stage, sorghum grains have already accumulated about 50% of the final dry mass. Thus, the period around flowering is critical for defining not only the final number of grains per head but also the potential maximum kernel size. Final seed weight will be determined when the grains reach physiological maturity (visualized as a "black-layer" near the seed base). From this time until harvest, the grains will dry down from approximately 35% to 20% moisture content.

The interaction among all four components will determine the actual yield, but a wide range of variation can be expected in all these main yield-driving forces (Figure 1).

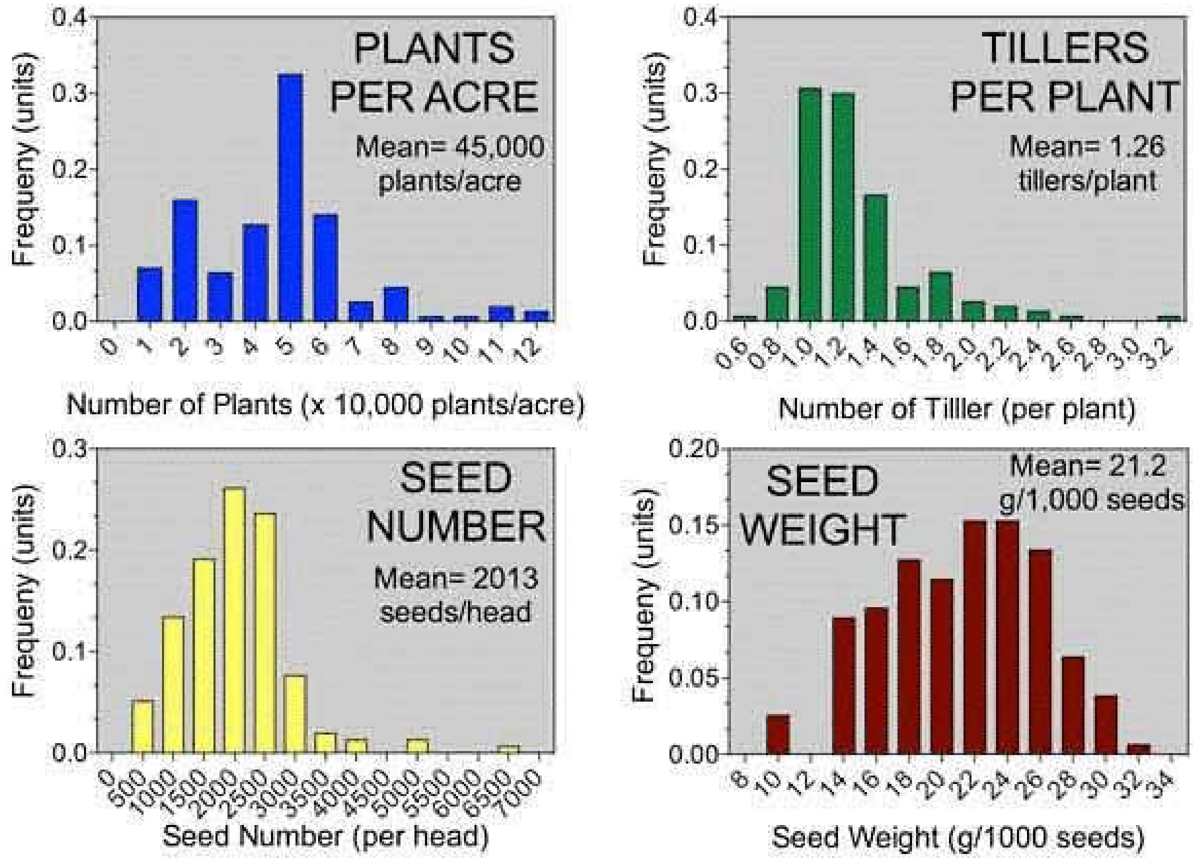

Figure 1. Example of the variation expected to be found in the main sorghum yield components. The number of tillers per plant can also be interpreted as the number of heads per plant, considering that all tillers have one fertile head.

Seed number is the main driving force of sorghum yield. Actual seed counts per head would make the estimates more accurate but requires considerable time and effort.

Ignacio A. Ciampitti, Crop Production and Cropping Systems Specialist
ciampitti@ksu.edu

7. Grain sorghum yield potential: An on-farm calculation

Estimating crop yields before harvest can be erratic, but producers often like to know about the potential yield of their crops.

When can I start making sorghum yield estimates?

As the sorghum crop gets closer to full maturity, yield estimates will be more accurate because the seed weight will be closer to being set. Nonetheless, we can start taking yield estimations three to four weeks after flowering (from soft to hard dough stages). At these stages, the final seed number can still change. In addition to the seed number, the seed weight will be only partially determined -- approximately 50 to 75% of dry mass accumulation as compared to the final weight. Each of the main sorghum yield components is discussed in more detail in a companion article in this eUpdate issue, "Grain sorghum yield potential: Understanding the main yield components".

Variability within the field

Variability between plants needs to be properly accounted for when estimating sorghum yields using the on-farm approach (see next section). Another important factor is the variation between different areas in the field. In general, it is recommended to perform yield estimations in at least 5 to 10 sections of the field to account for field variability.

On-farm approach for estimating sorghum yields

The estimation of sorghum yields should consider the main driving forces:

1. Total number of heads per unit area [number of plants per acre x heads per plant] (**1**)
2. Total number of seeds per head (**2**)
3. Number of seeds per pound (**3**)
4. Pounds per bushel, or test weight, which for sorghum is **56 lbs/bushel** (**4**)

The final equation for estimating sorghum yields:

[**1** x **2** ÷ **3**] ÷ **4** = Sorghum yield in bushels/acre

Take the following steps for making sorghum yield estimates:

Step 1. Number of heads per unit area:

For this on-farm approach, start by counting the number of heads from a 17.4-foot length of row when the sorghum is in 30-inch rows. This sample area represents 1/1000th the area of an acre. If the sorghum is in 15-inch rows, then count the number of heads in two rows. For a 7.5-inch spacing, measure four rows. In each of these scenarios, the area counted will be equal to 1/1000th of an acre.

Take head counts in several different areas of the field to properly account for the potential yield variability. If the proportion of smaller heads, < 3 inches in height, is very low (< 5%), these heads could be avoided due to the smaller proportion they will represent when determining the final yield.

Step 2. Estimation of the number of seeds per head:

The seed number is, by far, one of the most complicated yield components that needs to be estimated. The total number of seeds per head can vary from 100 to 5,000 seeds per head, but almost ¾ of the seed number distribution is around 1,500 to 2,500 seeds per head.

A quick method uses an estimate of seed counts per head, we can utilize a very simple association between the yield level, conditions around pollination/grain set time, and the number of grains per heads (Figure 1). The number of seeds per pounds, or seed weight, is also a factor we need to estimate, but this factor is relevant for yield contribution, with a less clear relationship with yield (Figure 1).

This method of estimating seed counts is summarized in Table 1. If conditions were very poor during pollination and grain set and the general yield environment is low, the total number of seeds per head will average around 500-1,000 seeds per head (900; Table 1). If conditions around flowering were very favorable and the general yield environment is very high, then the number of seeds per head could be around 1,500 to 3,500 (2,500). Intermediate yield environment scenarios can occur if a portion of the three-to-four week period around flowering was favorable and part of it was unfavorable. In that case, the number of seeds per head could range from 1,000-3,500, with an average of 1,745 seeds per head.

This information is provided only for general guidance on estimating sorghum yield potential using the on-farm approach.

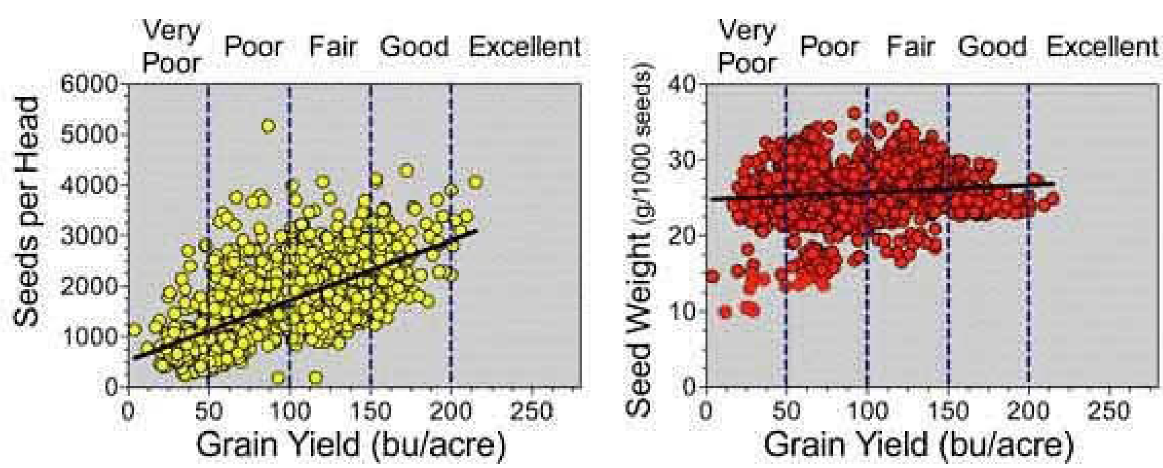

Figure 1. Relationship between grain yield and yield components, seeds per head (yellow points, left panel) and seed weight (red data points, right panel). The number of seeds per head has the most direct relationship with yield.

Table 1. Total number of seeds per head and seed weight components.

Yield Range (bu/acre)	Crop Condition	Average Seeds per Head	Average Seed Weight (g/1,000)	Number of Observations
<50	Very Poor	900	24.5	154
50-100	Poor	1,500	25.5	391
100-150	Fair	2,000	26.2	495
150-200	Good	2,500	25.6	129
>200	Excellent	3,330	25.5	5

Step 3. Estimation of the Seed Weight:

A similar procedure can be followed to estimate the seed weight (Table 1). For the seed weight component, the variation documented in the dataset showed a very narrow seed weight variation as compared with the variability found in the seed number component. In general, it seems that lower seed weight is expected at low yield ranges, but the difference among yield levels is negligible. Table 2 shows the conversion from average seed weight to seeds per pound, and from seeds per pound to the seed size factor employed in the examples below for sorghum yield estimation.

Table 2. Seed weight, seeds per pound.

Yield Range (bu/acre)	Crop Condition	Average Seed Weight (g/1,000)	Seeds Per Pound
<50	Very Poor	24.5	18,520
50-100	Poor	25.5	17,793
100-150	Fair	26.2	17,318
150-200	Good	25.6	17,723
>200	Excellent	25.5	17,793

Step 4. Final calculation using "On-Farm" Yield Estimation Approach:

[(Heads x Seeds per Head) x 1,000 ÷ Seeds per Pound] ÷ Pounds per bushel

Example A. Good Crop Condition:

Irrigated sorghum with adequate plant density (48,000 plants/acre), average number of tillers per plant of 1.3, and good yield environment with adequate flowering and grain filling periods:

(48 plants in 17.4 foot -1/1000th of an acre- x 1.3 fertile tillers per plant) = 62 heads

Yield Estimation = [(62 x 2,500) x 1,000 ÷ 17,723] ÷ 56 = **156 bu/acre**

Example B. Poor to Fair Crop Condition:

Dryland sorghum with adequate plant density (40,000 plants/acre), average number of tillers per plant of 1.3, and poor flowering but fair grain filling period:

Yield Estimation = [(52 x 1,500) x 1,000 ÷ 17,723] ÷ 56 = **79 bu/acre**

Example C. Very Poor Crop Condition:

Dryland sorghum with adequate plant density (40,000 plants/acre), average number of tillers per plant of 1.0, and poor yield environment and growing season (poor flowering and grain filling period):

Yield Estimation = [(40 x 900) x 1,000 ÷ 18,520] ÷ 56 = **35 bu/acre**

Ignacio A. Ciampitti, Crop Production and Cropping Systems Specialist
ciampitti@ksu.edu

8. Updated cover crop selection tool now available for Midwest farmers

Choosing the best cover crop for a particular cropping system can be difficult. Many factors are involved when selecting the most appropriate cover crop. The Midwest Cover Crops Council (MCCC) has released an improved cover crop selection tool to help farmers determine the best types of cover crops for their fields. The MCCC is made up of representatives from 12 Midwest states, the Canadian province of Ontario, and select universities, including Kansas and Kansas State University.

With this tool, users select their state/province and county and then select the goals they have for cover crops — erosion control, nitrogen scavenger, fighting weeds, providing forage, etc. (Figure 1). They also can provide information about the cash crops they are planting and drainage data for their fields. The tool offers the best cover crop options for the specified conditions. Clicking on the cover crops brings up data sheets that offer more information about each crop, including seeding rates, termination methods, performance and cultural traits, and more.

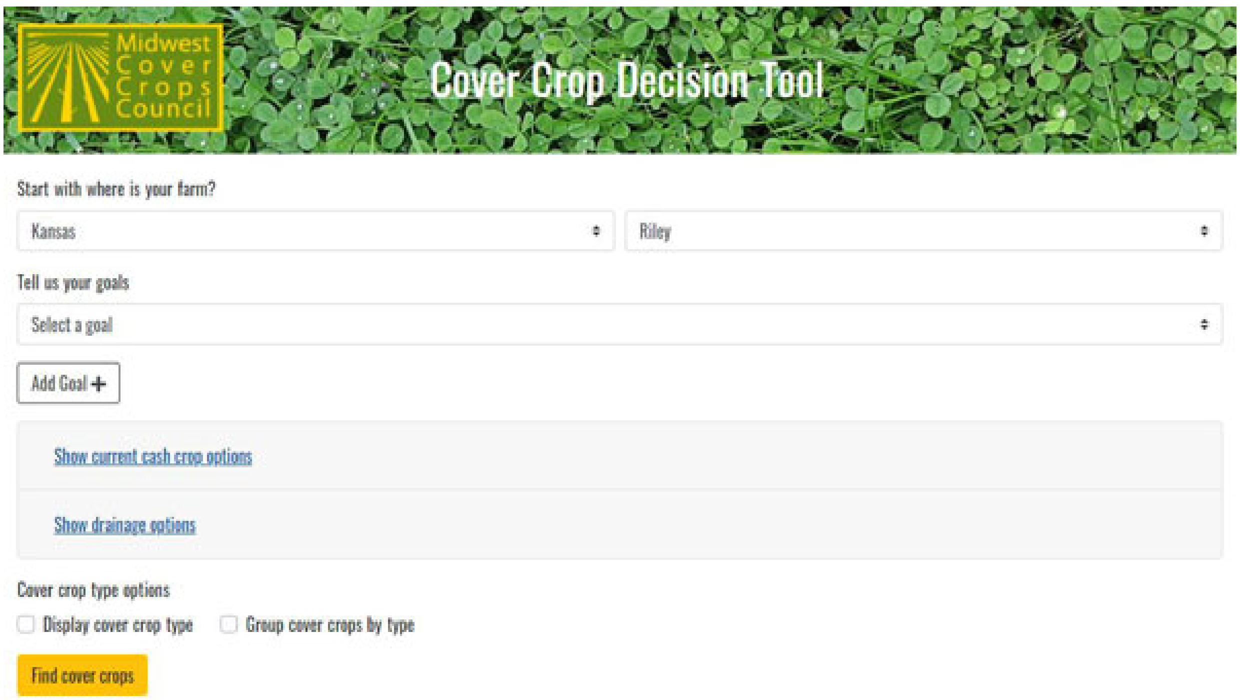

Figure 1. Cover crop decision tool homepage. Users can select their state, county, and desired goals for their cover crops. Additional selections can be made for current cash crop and field drainage. Image from mccc.msu.edu.

The updated tool includes more accurate seeding dates for each county based on 30-year National Oceanic and Atmospheric Administration frost date data; changes to seeding dates and rates to align with new research; and is now mobile-friendly and complies with the Americans with Disabilities Act.

The MCCC will hold a live, one-hour webinar at 11 a.m. (CT) on Sept. 23 to demonstrate the new tool and answer questions. To register for the webinar, view a recorded version later, and/or access the tool, go to **mccc.msu.edu/selector-tool/.**

DeAnn Presley, Soil Management Specialist
deann@ksu.edu

Peter Tomlinson, Environmental Quality Specialist
ptomlin@ksu.edu

9. Ag-Climate Update for August 2020

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.

August 2020: Mostly cool and dry across the state

August was much drier than normal. It ranked as the 12th driest August since 1895. All divisions averaged below normal for the month, intensifying drought in the west and with slow drought expansion in the east. Lack of moisture had negative impacts on dryland corn (Figure 1). Statewide average precipitation was 1.62 inches, 49% of normal. The West Central Division was the wettest with an average of 2.27 inches, 89% of normal. Overall, there were 12 new daily precipitation records in the state. Leoti in Wichita County had the highest total at 4.56 inches.

Temperatures were close to normal. The statewide average for August was just 0.5 degrees cooler than normal. The thermal heat unit accumulation was driven by warm minimum temperatures. Statewide there was one new daily record highs and six new record warm lows.

Figure 1. Drought-stressed corn in Wallace County. Photo by L. Schemm

View the entire August Ag-Climate Summary, including the accompanying maps and graphics (not shown in this summary), at http://climate.k-state.edu/ag/updates/.

10. 2021 soybean planting intentions survey - Producer input requested

The Agronomy Extension specialists at Kansas State University need your help!

We are looking for information from soybean producers across the state about their planting intentions the 2021 growing season. Participation in this very quick survey will help in the planning of our fall and winter extension presentations. This survey is completely anonymous. A summary of the results may be shared as research findings to help other Extension programs.

If you are willing to participate, you can find the survey here: 2021 Soybean Planting Intentions Survey.

Sarah Lancaster, Extension Weed Science Specialist
slancaster@ksu.edu