Issue 1020

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eUpdate

09/12/2024

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

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1. Soybean seed filling and dry down rate before harvest

The latest USDA-National Agricultural Statistics Service crop progress and condition report, released September 8, 2024, classified 78% of the soybean crop as being in fair (30%) or good (48%) condition. Overall, 23% of all soybeans in Kansas are dropping leaves, below last year's (32%) but ahead of the 5-year average (20%).

Weather outlook

The weather conditions expected for the last portion of September will be critical for soybeans as they relate to seed filling and determining the final seed weight.

Temperatures in September have averaged slightly below normal across the state, but warmer weather has returned this week and is forecast to persist into next week. Precipitation has been below normal across almost all of the state, with just a few areas above normal, specifically the McPherson and Emporia areas, where isolated storms brought significant rainfall earlier this month. Precipitation next week is forecast to be below normal, with elevated chances for above-normal precipitation the following week. Seasonally, we continue the weekly decrease in normal precipitation as we head towards the driest season of the year (winter). As a result, below-average precipitation means potentially very little, if any, moisture. Warm and dry conditions will favor overall low humidity, increasing drought, and wide day/night temperature swings.

Soybean seed-filling

Final maturity is defined as the formation of the black layer in the seeds. Soybeans will reach final maturity with high seed water content, moving from 75-80% (R6) to around 50% (R7) from the beginning of seed filling until final maturity (Figure 1). Seed dry matter accumulation and moisture changes will depend on the maturity group (affecting the length of the season), planting date, and weather conditions experienced during the latter part of the reproductive phase.

Soybean seed water loss can divided into two main phases: 1) before "black layer" or maturity, and 2) after black layer.

The overall contribution of seed weight to final yields can be studied by evaluating changes in seed weight during the seed-filling period (Figure 2). Overall, a seed-filling period of more than one month (37 days) duration until black layer was achieved (this is the reference for changes in seed weight). The graph of seed filling provides a visual of the overall rate, increase in seed weight per day, and the duration of the seed filling.

From this example, we can observe that when the duration is reduced by one week (from 37 to 30 days), the attainable yield goes from 61 to roughly 50 bushels per acre. Potential factors impacting the duration (beyond the current heat/drought) of leaf green area imposed by insects, diseases, hailstorms, and any other abiotic stress conditions such as cloudy days and early frost impacting the crop during the coming weeks will negatively affect the seed filling conditions for soybeans.

For this current season, we can largely expect negative yield impacts due to the last heat wave combined with drought conditions, which resulted in poor seed weight and potentially increased late pods and seeds' abortion. Overall, seed weight contributes roughly 30-40% of the final total yield for this crop, emphasizing the impacts of the stress conditions on the attainable yields.

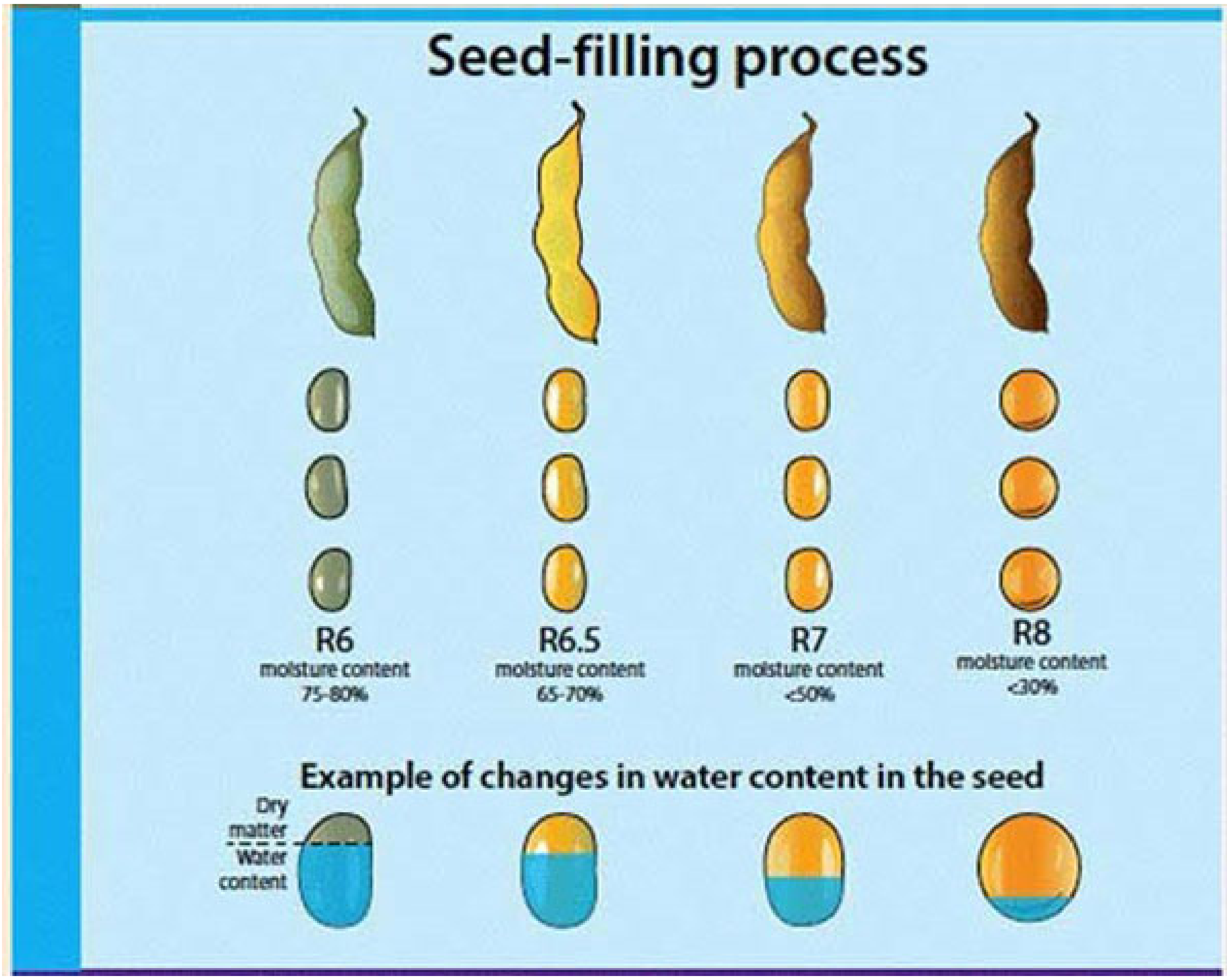


Figure 1. Soybean seed filling process from full seed to full maturity. Photo and infographic prepared by Ignacio Ciampitti, K-State Research and Extension. Taken from Soybean Growth and Development, MF3339.

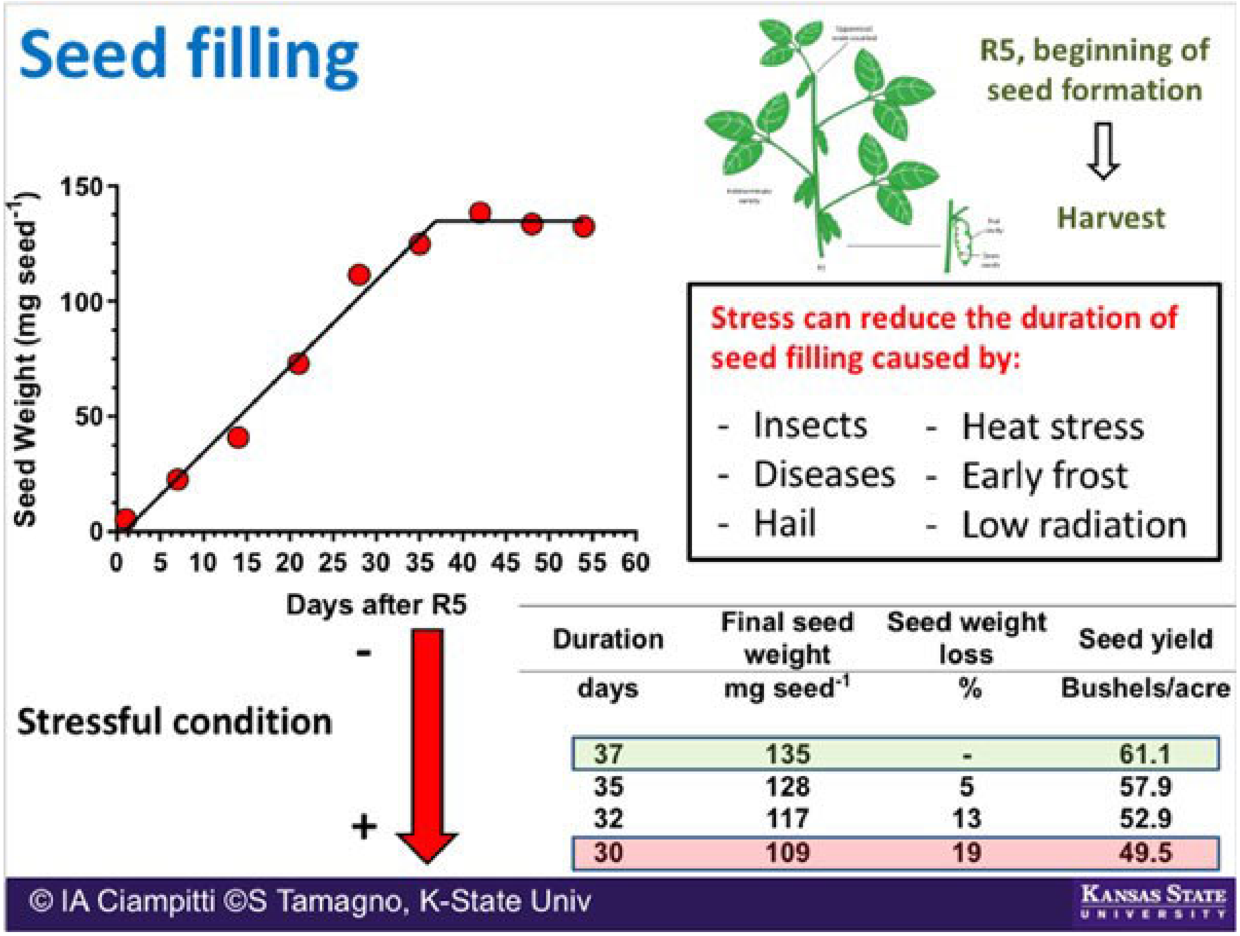


Figure 2. Soybean seed weight changes from the beginning of seed filling (R5) to full maturity. Photo and infographic prepared by Ignacio Ciampitti and Santiago Tamagno, K-State Research and Extension.

Soybean dry down

Soybeans reach final maturity with high seed water content, moving from 90% to around 60% from the beginning of seed filling until final maturity. Final maturity is defined as the formation of the black layer in the seeds. The dry down rate will depend on the maturity group (affecting the length of the season), planting date, and weather conditions experienced during the latter part of the reproductive phase.

To address the question related to the dry down rate for soybeans, a study was conducted to investigate the changes in water content from black layer formation (maturity) until harvest time (Figure 3). During the last days of September and mid-October 2016, the overall dry down rate was around 3% per day (from 58% to 12% seed moisture) – taking an overall period of 15 days.

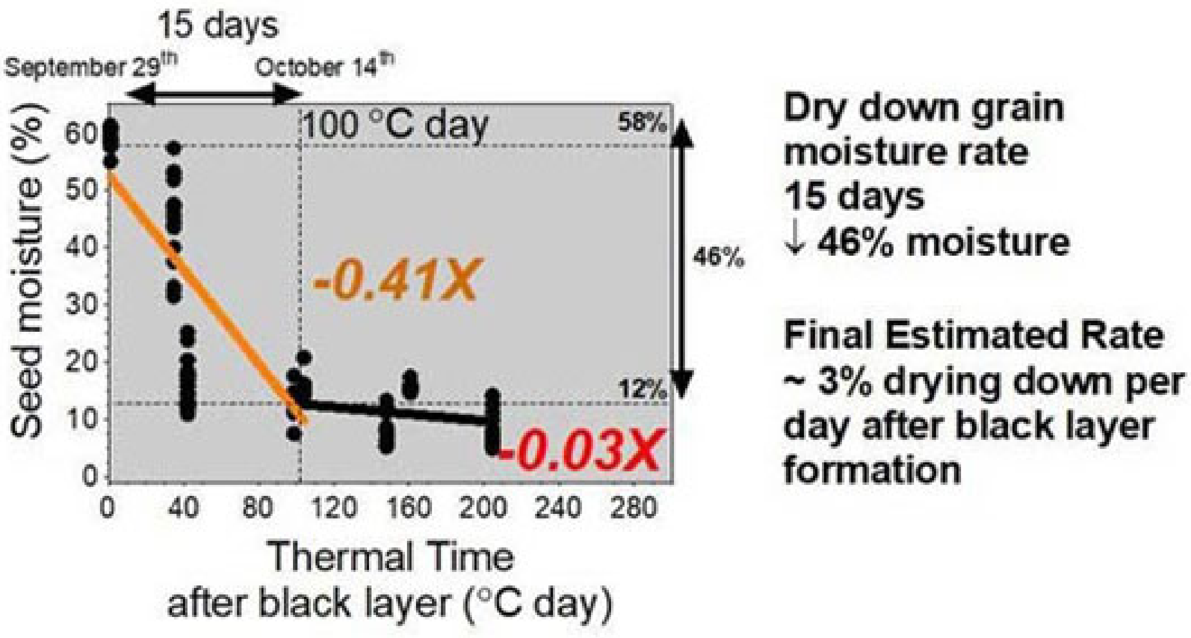


Figure 3. Grain moisture dry down (orange line) across three hybrids and different N rates near Manhattan, KS. Horizontal dashed lines marked the 58% seed moisture at black layer formation. * Graph prepared by Ignacio Ciampitti, K-State Research and Extension.

**Note: To maximize the final seed volume to be sold, it is desired to reach harvest with 13% seed moisture, thus the importance of timing harvest with the right seed moisture content.*

Soybean dry down rate was three times faster, at 3% per day, relative to corn, at 1% per day. These dry down rates for corn and soybeans are primarily affected by temperature, humidity, and overall water content at the point of black layer formation (maturity). These main factors should be considered when scheduling the soybean harvest.

With the current weather conditions, soybeans entering maturity could be ready to harvest in less than two weeks. Therefore, scout your fields to check for maturity and prioritize situations with lodging or other stress factor that could compromise plant standability, ultimately affecting seed quality.

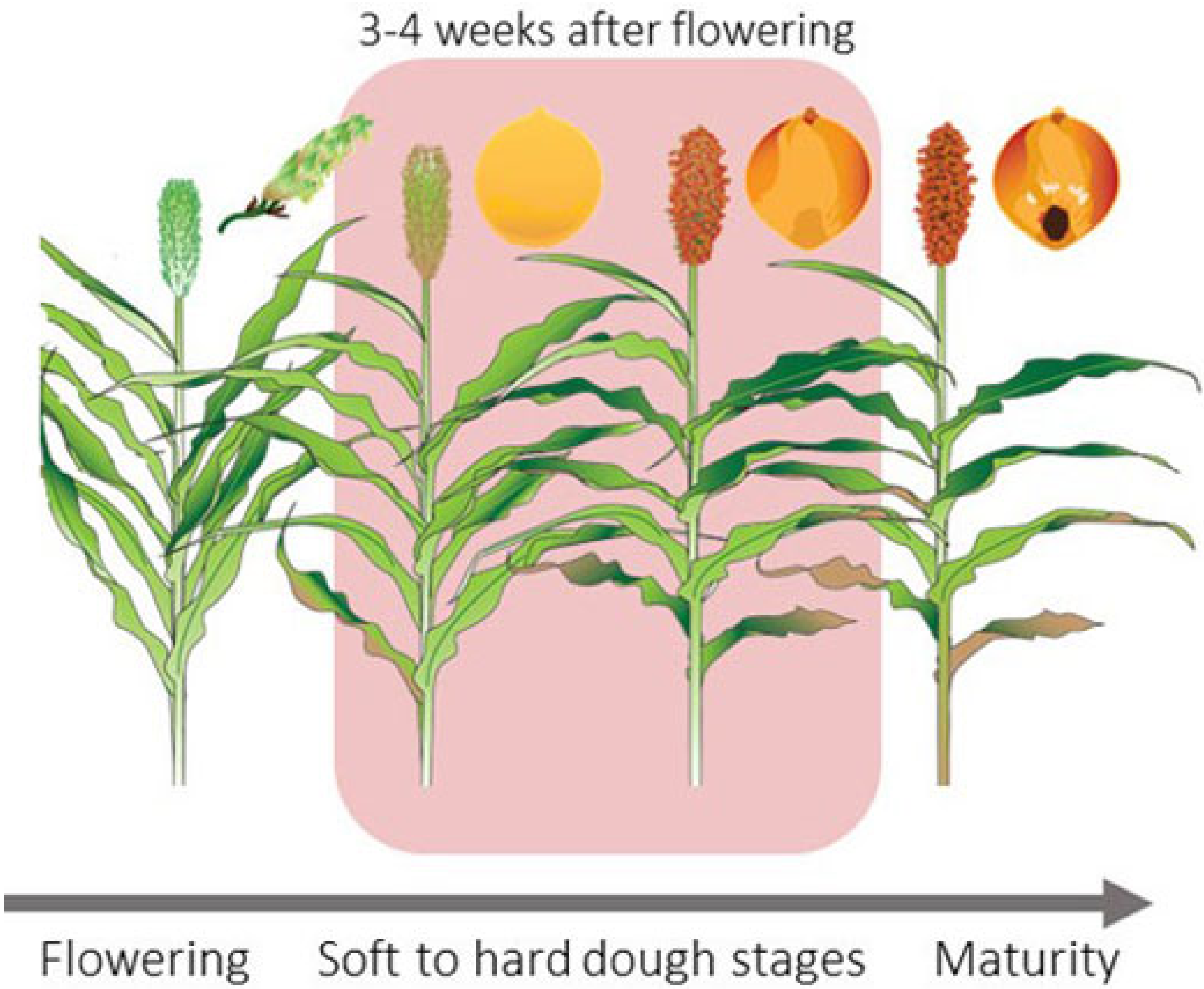
Ignacio A. Ciampitti, Farming Systems
ciampitti@ksu.edu

Matthew Sittel, Assistant State Climatologist
msittel@ksu.edu

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

Even though estimating crop yields before harvest can be difficult, having these estimates is valuable information for producers as it helps them to make relevant decisions on inputs.

When can I start making sorghum yield estimates?



As the sorghum crop gets closer to maturity, yield estimates will be more accurate. 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 attained at maturity.

A companion article in this eUpdate issue, "Grain sorghum yield potential: Understanding the main yield components," discusses each of the main sorghum yield components in more detail.

Variability within the field

When estimating sorghum yields using the on-farm approach, variability between plants needs to be properly accounted for (see next section). Another important factor is the variation between different areas in the field. In general, yield estimations should be performed 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]
2. Total number of seeds per head
3. Number of seeds per pound
4. Pounds per bushel, or test weight, which for sorghum is **56 lbs/bushel**

The final equation for estimating sorghum yield in bu/acre is:

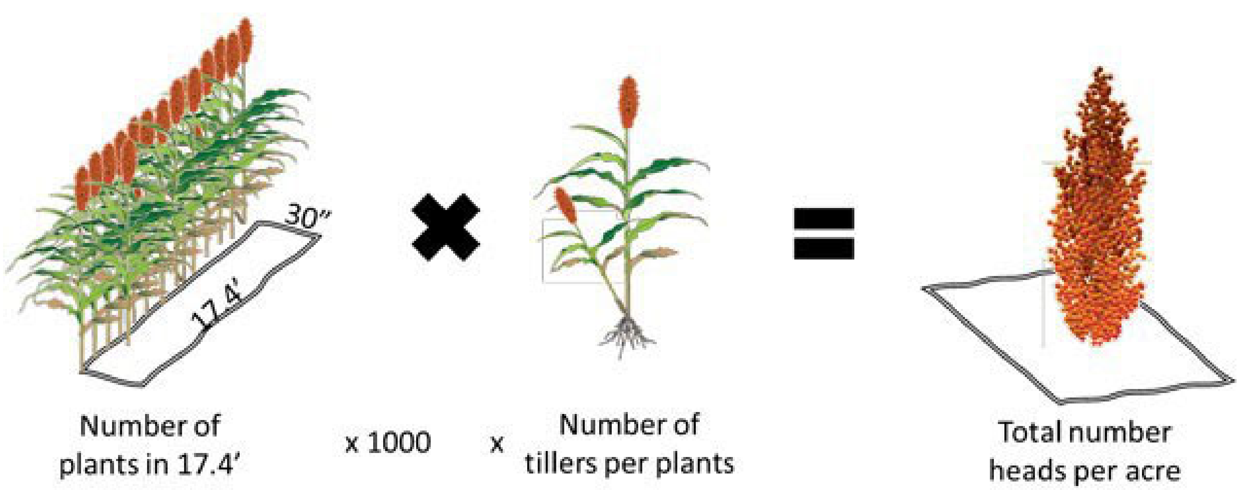
$$\frac{\text{Total number of heads per acre} \times \text{Total number of seeds per head} \div \text{Number of seeds per pound}}{\text{Pounds per bushel } \left(56\,\frac{\text{lbs}}{\text{bu}}\right)}$$

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 row spacing. This sample area represents 1/1000th the area of an acre. If the sorghum is in 15-inch row spacing, then count the number of heads in two rows. For a 7.5-inch spacing, take into account four rows. In all scenarios, the area counted will equal 1/1000th of an acre.

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



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 head (Figure 1). The number of seeds per pound, or seed weight, is also a factor we need to estimate, but this factor is relevant for yield contribution and has 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 was 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.

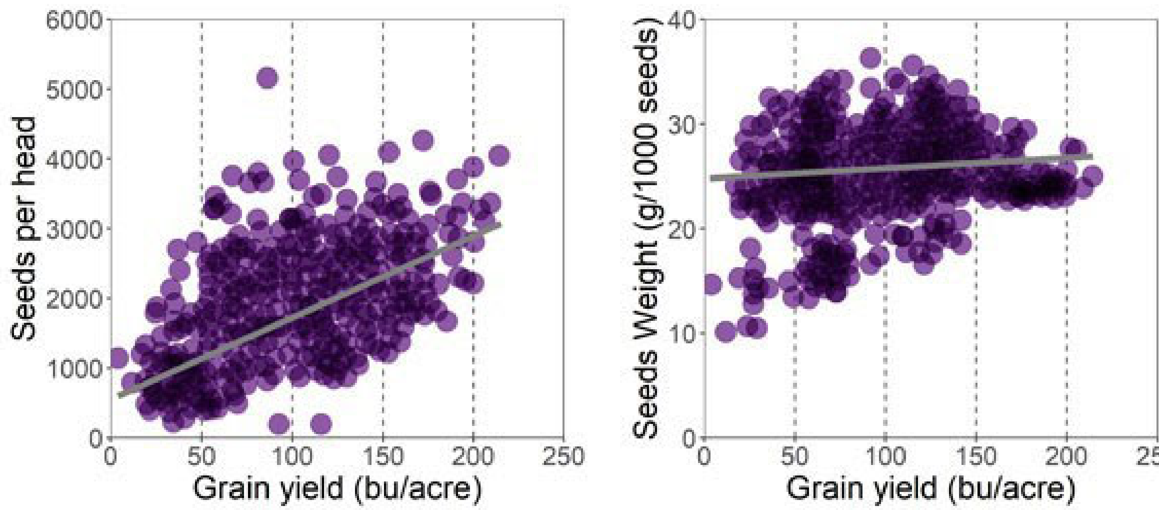


Figure 1. Relationship between grain yield and yield components, seeds per head (left panel), and seed weight (right panel). The number of seeds per head has the most direct relationship with yield.

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

Yield range	Crop condition	Average Seeds	Average Seed	Number of

(bu/acre)		per head	weight (g/1000)	observations
<50	Very poor	900	24.5	154
50-100	Poor	1500	25.5	391
100-150	Fair	2000	26.2	495
150-200	Good	2500	25.6	129
>200	Excellent	3330	25.5	5

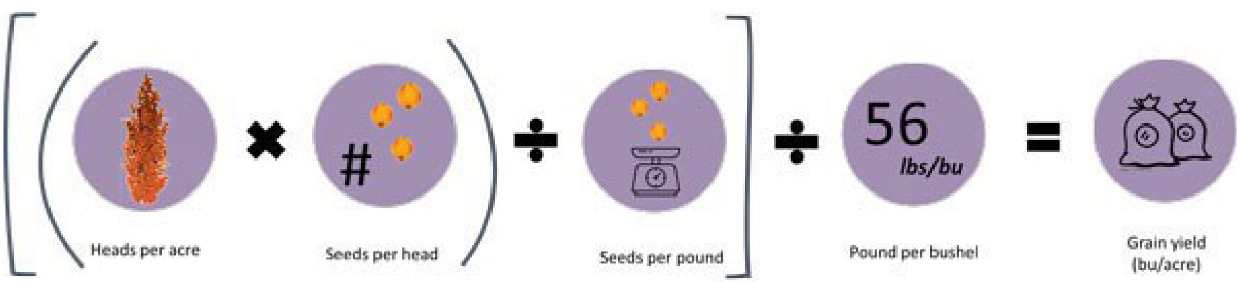
Step 3. Estimation of the Seed Weight:

A similar procedure can be followed to estimate the seed weight (Table 1). For the seed weight component, the dataset showed a very narrow variation as compared with the variability in the seed number. Generally, lower seed weight is expected at low yield, but the difference among yield levels is negligible. Table 2 shows the conversion from average seed weight to seeds per pound.

Table 2. Seed weight, seeds per pound.

Yield range (bu/acre)	Crop condition	Average Seed weight (g/1000)	Seeds per pound
<50	Very poor	24.5	18520
50-100	Poor	25.5	17793
100-150	Fair	26.2	17318
150-200	Good	25.6	17723
>200	Excellent	25.5	17793

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



<u>Example A. Good Crop Condition:</u>

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:

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

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

Ignacio A. Ciampitti, Farming Systems
ciampitti@ksu.edu

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

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

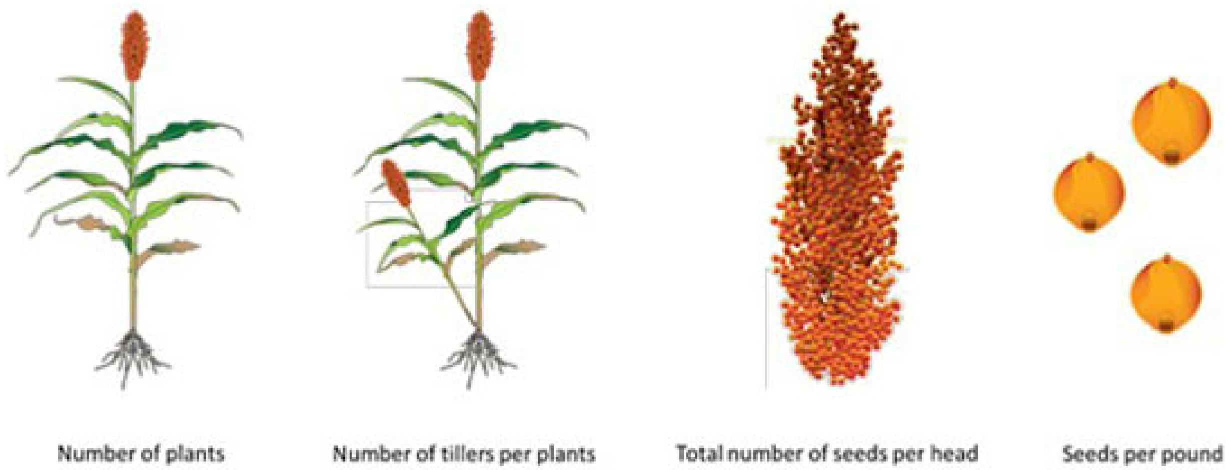


Figure 1. The four main components of sorghum yield are the number of plants, tillers, seeds per head, and seed size. Graphic by Ana P. Carcedo, K-State Research and Extension.

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 the planting date is delayed, the capacity of the plant to produce tillers will be reduced; thus, the 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 compared to 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 the final number of grains per head and the potential maximum kernel size. The 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 final yield, but a wide range of variation can be expected in all these main yield-driving forces (Figure 2).

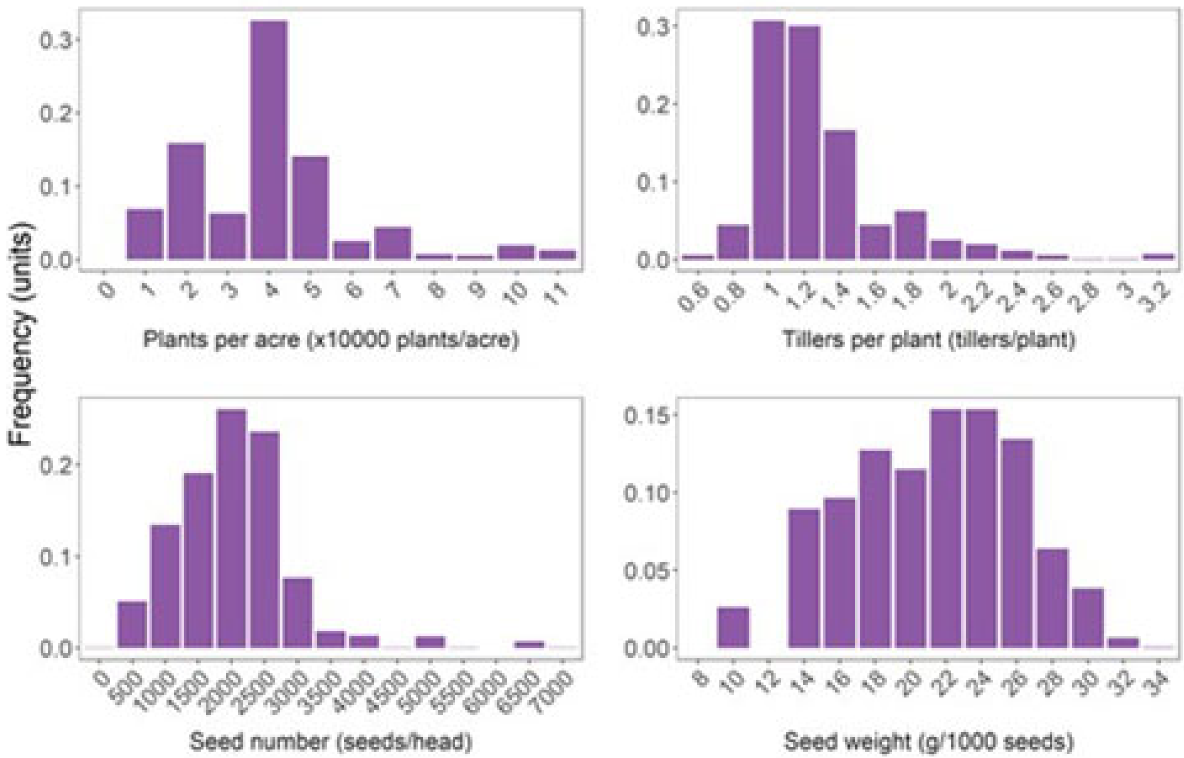


Figure 2. An example of the variation expected to be found in the main sorghum yield components. The number of tillers per plant can also be interpreted as the number of heads per plant, considering that all tillers have one fertile head.

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

Ignacio A. Ciampitti, Farming Systems
ciampitti@ksu.edu

4. Test forages to prevent nitrate and prussic acid poisoning

Many Kansas cattle operations rely on some type of harvested feed to use in the winter months, and common among those sources are forage sorghum, millets, sorghum-sudangrass, and sudan. Forages in the sorghum family are prone to two different problems when feeding cattle: nitrate poisoning and prussic acid (hydrocyanic acid, HCN) poisoning. Millet (proso and pearl) do not contain prussic acid but can have nitrates. Prussic acid and nitrate poisoning are easy to confuse because both result in a lack of oxygen availability to the animal and are more likely to occur when the plant is stressed (fertility, hail, drought).

Table 1. Key characteristics of nitrate and prussic acid poisoning.

Parameter	Nitrate	Prussic Acid
Plant parts most affected	Base of plant	Young or new growth
Types of plants	Many, especially sorghum family, pigweed (palmer amaranth, redroot, waterhemp), kochia, and oat	Many (> 3,000 plant species), most common: forage and grain sorghum, Johnsongrass, sorghum-sudangrass. Less common but possible: white clover, birdsfoot trefoil, Indiangrass, *Cyndon* spp. (Bermuda).
Grazing problems	Rarely a problem unless forced to eat entire stem/stalk or extremely high levels pre-grazing. Beware of weeds listed above.	Consumption of newest growth or regrowth
Hay	Not impacted by drying	There is mixed data, perhaps related to the testing method, but the risk in hay is not zero.
Silage	Reduced 40-60% by ensiling	Reduced 40-60% by ensiling
Green Chop	High risk	Less risk than grazing; not as much reduction as silage
Time of death	Several hours after consumption	Within minutes of consumption, treatment can rarely occur fast enough to save the animal
Blood/Oxygen	Chocolate brown colored blood, hemoglobin converted to methemoglobin and unable to carry oxygen	Blood bright cherry red, hemoglobin contains oxygen, but not available to cells

In dry areas of the state, cattle may be removed from pasture early. Bringing hungry cattle into pens with weeds can be very dangerous as the nitrate concentration may be elevated throughout the plant and animal intake high. Manure in corrals can contribute to the elevation of nitrates in the weeds. Elevated nitrates may not result in death but could cause abortions. Be careful never to turn hungry cattle onto weeds, minimize consumption of weeds in corrals, and have other safe feed to consume besides weeds to reduce risk.

Prussic acid concentrations are greater in fresh forage than in silage or hay because HCN is volatile and dissipates as the forage dries or ensiles. Additionally, hay or silage that likely contained high cyanide concentrations at harvest should be analyzed before it is fed. This second statement is often forgotten, and it's assumed that when the plant dries, all the cells are ruptured and any HCN is released. To confirm this, we measured dhurrin content in sorghum hay. The dhurrin content was stable from 1 week to 2 months of dry storage. In the plant, dhurrin (the precursor to HCN in sorghum species) and the enzyme that converts it to cyanide are stored in separate compartments within the cell. The compartments are ruptured when the plant is eaten, and the cyanide is formed and released. While the enzyme that converts dhurrin to cyanide is inactivated with drying, rumen enzymes can make the same conversion after consumption. If hay is made from forages in the sorghum family or other susceptible species, testing for prussic acid in forage that has suffered from drought, hail, or fertility issues is advised. The frequency of issues with prussic acid in harvested forages may be relatively low; however, testing is cheap compared to the cost of losing even one animal.

Management recommendations common to both prussic acid and nitrates include:

- Test first, don't gamble. Keep in mind that different labs use different tests that have different scales.
- Feed animals with a known safe feedstuff(s) and have them full before introduction to potentially problematic feeds. Don't turn in hungry.
- Ensiling will reduce concentrations of either by 40-60% in well-made silage, but silage put up under less-than-optimal conditions could still contain very high levels. If extremely high before ensiling, a 50% reduction may not be enough to result in safe feed. Test ensiled feed before feeding.
- Dhurrin concentrates in the newest growth and regrowth of the plant and with more plant growth (>24"), concentration levels may be diluted if measuring the whole plant.
- Nitrate concentrates in the base of the plant and is least in head and leaves, grazing or cutting high can reduce nitrate levels in the forage.
- Do not harvest drought stressed forage within 7 to 14 days after good rainfall to reduce the levels of accumulated nitrates.

If testing before grazing, samples should reflect what the animals are expected to consume, generally leaves and upper portion of the plant. Sample a minimum of 15 sites across a given field. One method is to sample from each corner and the center by walking diagonal lines and sample plants every 50-100 steps or as appropriate for field size.

We expect levels of nitrates and prussic acid to be variable across a field, so more samples are better than less. A rule of thumb is to sample 10 to 20% of the bales per field or cutting as a minimum. Be aware of areas of the field that exhibited more plant stress than others. If large enough areas, you may want to sample them separately. Your acreage size and feeding methods likely factor into this decision. Use a forage probe that cuts across all plant parts in a bale rather than a grab sample from individual bales or windrows. Most county extension offices can help with sampling procedures and equipment.

Prussic acid in sorghum following a freeze event

Frost causes plant cells to rupture and prussic acid gas forms in the process. Because the prussic acid is in a gaseous state, it will gradually dissipate as the frosted/frozen tissues dry. Thus, risks are highest when grazing frosted sorghums and sudangrasses that are still green. New growth of sorghum species following frost can be dangerously high in prussic acid due to its young stage of growth. It is recommended to wait ten days until after a killing freeze before grazing. Sorghum and sudangrass forage that has undergone silage fermentation is generally safe to feed.

For more complete information on these problems, see these publications: Nitrate Toxicity, Prussic Acid Poisoning, and Managing the Prussic Acid Hazard in Sorghum. If you have samples with high prussic acid concentrations and are willing to share information on variety, growth, fertility, and harvest conditions, it will be helpful as we strive to understand this issue better.

Sandy Johnson, Extension Beef Specialist, Northwest Research-Extension Center
sandyj@ksu.edu

John Holman, Cropping Systems Agronomist, Southwest Research-Extension Center
jholman@ksu.edu

Augustine Obour, Soil Scientist, Agricultural Research Center - Hays
aobour@ksu.edu

Logan Simon, Area Agronomist - Southwest Research-Extension Center
lsimon@ksu.edu

5. Seed treatment fungicides for wheat disease management

Seed treatments are an important part of wheat production in Kansas. The K-State publication MF2955, *Seed Treatment Fungicides for Wheat Disease Management,* is available at http://www.ksre.ksu.edu/bookstore/pubs/MF2955.pdf.

This publication provides information about setting seed treatment priorities, considerations for seed treatment success, a key to common seed treatment active ingredients, and a list of some of the more common seed treatments labeled for use in Kansas.

Most fungicide seed treatments protect against several seed-borne diseases (common bunt, loose smut, flag smut) and seedling diseases that may result in poor emergence or damping off. Additionally, fungicide seed treatments should be a priority if the seed is saved from fields with Fusarium head blight.

Additional considerations for seed treatments:

Fungicide seed treatments help keep seed-borne diseases such as smuts and bunts in check. Loose smut and common bunt, sometimes called, "stinking smut", can be controlled very effectively with most commercial treatments that include an 'azole' fungicide (think tebuconazole or difenoconazole). Some regions of the state have struggled with these diseases in recent years. If you are planning to keep seed that is known to have common bunt or loose smut, it is critical to use a fungicide seed treatment to avoid more severe problems in the future.

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

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

Some fungicide seed treatments also suppress the fall development of foliar diseases. For example, treatments containing tebuconazole and difenoconazole provide some protection against fall infections of powdery mildew, leaf rust, and Stagonospora leaf blotch. It is important to note that most seed treatment fungicides will provide a maximum of 30-45 days of control. A seed treatment will not prevent the disease from becoming reestablished in the spring, and foliar fungicide applications may still be required to protect the yield potential of the crop.

Things to remember

As with most things in agriculture, producers must balance the possible benefits against the cost. Some growers also prefer not to risk having leftover treated seed to deal with at the end of planting. If the seed is treated on-farm, pay close attention to thoroughly covering the seed. Incomplete coverage can reduce the efficacy of the seed treatment.

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

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

Romulo Lollato, Extension Wheat Specialist
lollato@ksu.edu

6. Emergency measures to control wind erosion

Cropland can be quite susceptible to wind erosion under some conditions. Drought conditions may limit vegetative growth and cover. Burning or removing crop residues for forage creates a particularly serious hazard. Winter wheat and other fall-planted crop fields may also be susceptible during periods of low cover before crop establishment after planting. This is particularly true during drought (Figure 1). Marginally productive cropland may not produce sufficient residue to protect against wind erosion. In addition, overgrazed or poorly vegetated rangeland may also be subject to wind erosion.

Recent wind conditions in western Kansas have been conducive to erosion. While this isn’t the time of year when high winds are prevalent, that doesn't mean particularly windy days won’t occur. It is important to monitor field conditions and identify fields in a condition to blow. Such conditions include low vegetation cover and a high proportion of erodible-sized clods (less than 1 mm in size or about the thickness of a dime). It is better to be proactive and treat potential problems before they occur than to react and catch up once a field is eroding. Once soil movement has started, it is difficult to stop further damage completely. However, prompt action may prevent a small erodible spot from damaging an entire field or adjacent fields.

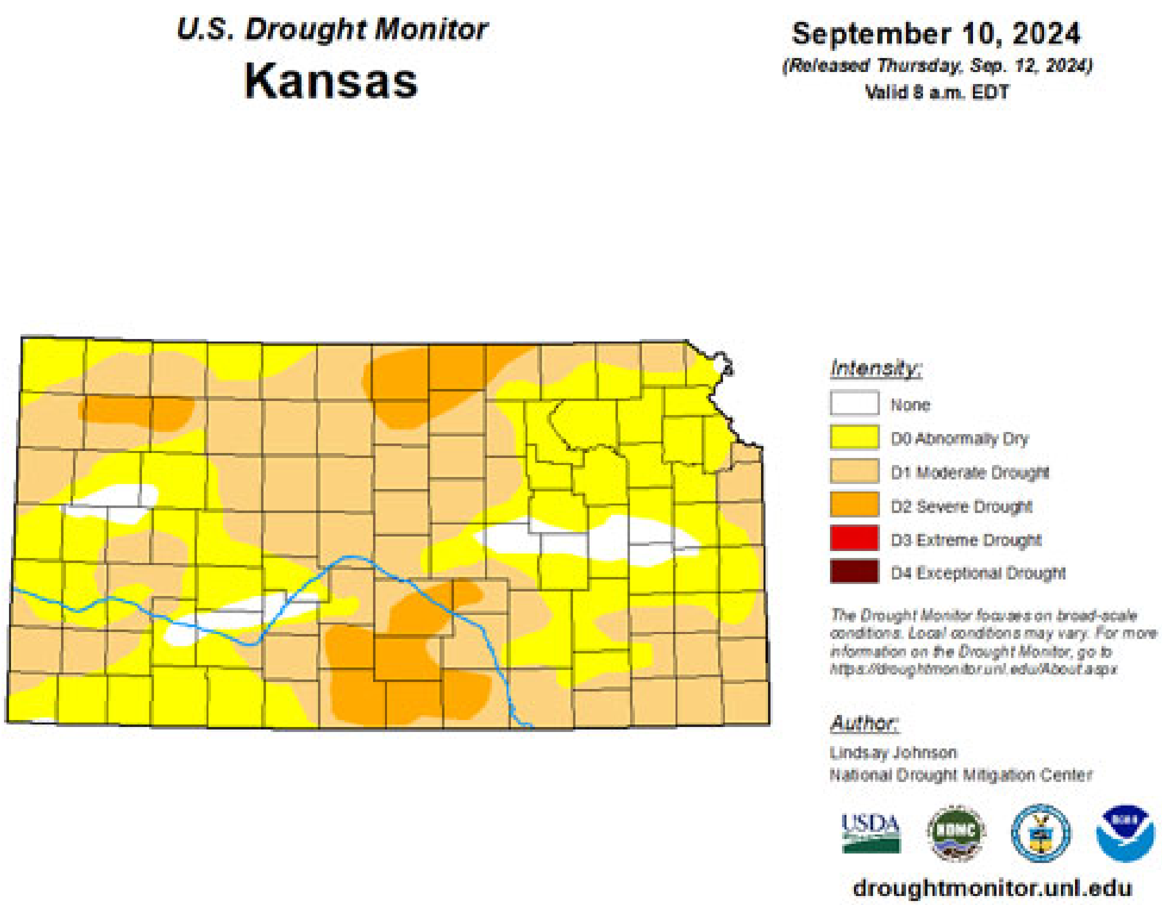


Figure 1. The current Drought Monitor for Kansas.

Emergency control measures

Mulching. If wind erosion has already started, it can be reduced by mulching with manure or other anchored plant materials such as straw or hay. To be effective, at least 1.5 to 2 tons per acre of straw or grass or 3 to 4 tons per acre of corn or sorghum stover are needed to control areas of erosion, and the straw or hay must be anchored. Residue can be spread by hand, spreader, or other mechanical equipment.

A stubble puncher or disk set straight may anchor residue and prevent it from being blown away. Wet manure should be applied at 15 to 20 tons/acre and not incorporated into the soil. Care should be taken not to add wheel paths parallel to the wind direction as the mulch is applied. Traffic areas and wheel paths can contribute to wind erosion.

Mulches are generally practical only for small areas, so they are most effective when applied before the soil starts to move. Producers should scout fields to identify areas that might be susceptible to wind erosion (low vegetation cover and a high proportion of erodible-sized clods less than the thickness of a dime) if they plan to use mulch or manure to control it.

Emergency tillage. Emergency tillage is a last-resort method that can be effective if done promptly and with the right equipment. Emergency tillage aims to make the soil surface rougher by producing resistant clods and surface ridges (Figures 2, 3, and 4). A rough surface reduces wind speed. The larger clods and ridges resist movement and provide traps to catch the moving soil particles.

Chisels with single or only a few tool ranks are frequently used to roughen the soil surface. For emergency tillage, the combination of chisel point size, speed, and depth that produces the roughest surface with the firmest, most resistant clods should be used.

Research has shown that a narrow chisel (2 inches wide) on 24- to 54-inch spacing, operated 3 to 6 inches deep will usually bring enough resistant clods to the surface to control erosion on fine-textured (clay-based) soils. A medium shovel (4 inches wide) can be effective for medium-textured soils (loamy). Spacings should typically be narrower where there is no cover and wider in areas of partial cover, such as a growing crop or plant residue.

If the erosion conditions recur or persist, a second, deeper chiseling should split the first spacing. Tillage passes should be made perpendicular to the direction of the prevailing wind, causing the erosion.

Figure 2. Emergency tillage was used to mitigate wind erosion on a vulnerable field in northwest Kansas. Photo by Jeanne Falk Jones, K-State Research and Extension.

Figure 3. Emergency tillage across 50 percent of the field. Photo courtesy of USDA-ARS Engineering and Wind Erosion Unit, Manhattan, Kansas.

Figure 4. Widely spaced shanks are used for emergency tillage, making clods to roughen the soil surface. Photo courtesy of the University of Nebraska.

If emergency tillage is used in growing crops covered by crop insurance, producers should check with their crop insurance providers regarding emergency tillage insurance rules. Emergency tillage does not significantly reduce wheat yields of an established crop. Studies in southwest Kansas and Manhattan demonstrate that the use of a chisel on 40-inch spacing reduced wheat yields by 5.5 bushels per acre in the emergency tillage area due to direct injury caused by the tillage action. Since the entire field is rarely tilled when performing emergency tillage, the overall yield reduction will be less than 5.5 bushels per acre. The use of emergency tillage can actually increase yields in the untilled portion of the field since that tillage will reduce the amount of damage to wheat caused by wind erosion. The overall reduction in yield for fields that have received emergency tillage has been as little as 1 bushel per acre in the studies mentioned above.

Performing emergency, clod-forming tillage across the field effectively reduces wind erosion. The degree of success of emergency tillage is highly dependent on climatic, soil, and cover conditions. It is often not necessary to till the entire field, but rather, it is very effective to perform emergency tillage passes across 50% of the field (till a pass, leave a pass, repeat). Narrow chisel spacing (20 to 24 inches) is best for this method.

If 50% of the area has been tilled and wind erosion persists, the omitted strips can be emergency-tilled in a second operation to make result in full-cover tillage. If a second tillage pass is needed, it should be at a greater depth than the first pass. Wide-chisel spacings are used in the full-field coverage method. The space between chisel grooves can be chiseled later should wind erosion persist.

All tillage operations should be perpendicular or across the direction of the prevailing or eroding wind. For most of Kansas, an east-west tillage direction is likely best.

The best wind erosion control is created with maximum surface roughness when resistant clods cover a major portion of the surface. Research shows that lower travel speeds of 2 to 3 mph generally produce the largest and most resistant clods. However, speeds of 5 to 7 mph produce the greatest roughness. Because clod resistance is usually reduced at higher speeds, the effect may not be as long-lasting as at lower speeds. Thus, higher speeds are recommended where erosion is already in progress, while lower speeds might be a better choice in anticipation of erosion.

The depth of tillage usually affects clod stability more than travel speed, but the optimum depth is highly dependent on soil conditions (such as moisture level) and compaction. Deeper tillage passes can produce more resistant clods than shallow passes.

If the problem is severe and the wheat has already been destroyed or the ground is bare, chisels 4 to 6 inches wide on a 24- to 30-inch spacing will generally provide enough clods to control erosion. The operating depth should be 4 to 6 inches.

Controlling wind erosion on sandy soils

Loose sandy soils require a different tillage approach to control erosion effectively. Clods cannot be formed at the surface that are sufficiently resistant to erosion on sandy soils. Erosion resistance is achieved by building ridges and furrows in the field to provide adequate protection.

To create sufficient surface roughness, a 14-inch moldboard lister spaced 40 to 50 inches apart (or an 8-inch lister on 20 to 24-inch spacing) is needed. The first listing pass should be shallow, not more than about 4 to 5 inches deep. Then, when additional treatment is needed, the depth should become progressively deeper. Alternatively, for the second treatment, the original ridge may be split.

Adding manure to the ridged surface may also be beneficial in these situations.

Tips for effective emergency tillage

- Watch the weather forecast for periods of high winds, particularly when soils are dry.
- Assess residue and plant cover before the wind blows and take preventive action with emergency tillage. It is much easier to prevent the problem from starting than to stop erosion after it begins. If you wait, the soil only gets drier, and some moisture is needed to form clods.
- Use the combination of tractor speed, tillage depth, and chisel point size to produce the roughest surface with the most resistant clods. If wind erosion is anticipated, do some test tillage before an erosion event to see what tillage tool, depth, and speed will provide adequate clods and surface roughness.
- Always start at the upwind location when the field is blowing. In addition to the area presently blowing, a sufficient area upwind of the eroding spot should be tilled.
- Till in a direction perpendicular to the prevailing wind direction. For row crop areas, it may be necessary to compromise direction and follow the row pattern. Maintain as much anchored stubble in the field as possible.

For more information, see K-State Research and Extension publication MF2206, *Emergency Wind Erosion Control*, at: http://www.ksre.ksu.edu/bookstore/pubs/MF2206.pdf

DeAnn Presley, Soil Management Specialist
deann@ksu.edu

7. Grasshoppers are abundant in many areas of Kansas

It is well understood that weather patterns can have a significant impact on grasshopper populations year to year. Warm, dry weather increases the survival of nymphs and adult grasshoppers, leading to increased egg production during the growing season, while cool, wet weather promotes fungal pathogens that can reduce egg and nymph survival. The abundance of grasshoppers being observed now is likely due to the weather patterns of the last couple seasons. Another factor influencing grasshopper populations is an abundance of food, especially broadleaf weeds. A diet high in these forbs leads to greater nymph survival, faster growth, larger adult grasshoppers, and increased egg production. Despite many areas still being impacted by some level of drought, sporadic rainfall over the growing season has helped weeds persist in many areas of the state, which has likely contributed to the noticeable number and diversity of grasshoppers currently being observed. As these weedy sources of food are exhausted or controlled, grasshoppers may shift their grazing over to anything still growing in the landscape. In areas with greater grasshopper pressure, seedling alfalfa and wheat could be at risk.

Figure 1. Adult grasshopper. Photo by Anthony Zukoff, K-State Research and Extension.

Before planting alfalfa, treatment should be considered if there are 15 or more grasshoppers per square yard around the planting area. Once planted and growing, consider treatment if 3-5 grasshoppers per square yard are found in the seedling alfalfa stand.

Vegetated borders around areas where wheat will be planted should be scouted ten days before planting. Consider treating those borders if there are 7 to 12 grasshoppers per square yard. Once growing, three or more grasshoppers per square yard within the field can destroy seedling wheat stands. If grasshopper populations are low to moderate, seed treatments can protect emerging wheat plants for several weeks if products are applied at the highest registered rate. Seed treatments will be less effective under severe grasshopper pressure as the insects can consume a large amount of leaf material before succumbing to the seed treatments. It is advisable to avoid planting too early, as this will help reduce the time that wheat must be protected.

Please refer to the most recent Alfalfa and Wheat Insect Management Guides for specific control information.

Alfalfa Insect Management Guide https://bookstore.ksre.ksu.edu/pubs/MF809.pdf

Wheat Insect Management Guide https://bookstore.ksre.ksu.edu/pubs/MF745.pdf

Anthony Zukoff, Extension Entomology Associate – Garden City
azukoff@ksu.edu

8. Late-planted soybeans may be at risk for insect damage

Many late-planted soybeans are still in the R2-R5 stage of development, which means they are still susceptible to pod worm and/or adult bean leaf beetle feeding. Adult bean leaf beetles (Figure 1) may feed on new foliage or, more importantly, may feed on green pods (Figure 2).

Figure 1. Adult bean leaf beetles. Photos provided by K-State Department of Entomology.

Figure 2. Pod damage by bean leaf beetles. Photo provided by K-State Department of Entomology.

Pod feeding may open this protective covering enough so the beans fall out, or for the beans to dry out, or to allow pathogens access to the bean. None of these scenarios enhance yield. These adult bean leaf beetles may feed on pods until there are no more, then move to overwintering sites. Pod worms, on the other hand, feed on the beans within the pod (Figure 3) but for only about two weeks while they are in the larval stage and while the pods are still green. Field monitoring should continue until plants are mature with no more green pods.

Figure 3. Soybean pod worm feeding on beans within a pod. Photo provided by K-State Department of Entomology.

Jeff Whitworth, Extension Entomologist
jwhitwor@ksu.edu

9. Update on fall armyworms and armyworms

There is much concern relative to “worms” feeding on brome and the prospect of those worms moving to wheat when it germinates. Infestations currently consist of either fall armyworms or armyworms. At this point, both seem to be mature larvae; thus, feeding damage is about finished for at least a couple of weeks. Fall armyworms do not usually overwinter in Kansas. Thus, after these larvae (worms) pupate in the soil and emerge as adult moths, hopefully, they will not oviposit in Kansas but head south for overwintering. Armyworms, however, can overwinter in Kansas. After they pupate in the soil, they may mate and search for actively growing plants to deposit their eggs. In agriculture, this is often brome or wheat. Late-planted wheat, however, often avoids this armyworm infestation. Plus, if there is no volunteer wheat available for these moths, that also helps tremendously to mitigate damage.

KSRE Crop Production Extension Agent Jay Wisbey provided a good example of a brome field affected by armyworm/fall armyworm feeding, plus some grasshoppers, coupled with dry conditions. The photo was taken near Gypsum in Saline County (Figure 1).

For more information about fall armyworms and/or armyworm management, please refer to the KSRE Wheat Insect Management Guide 2024 at https://bookstore.ksre.ksu.edu/item/wheat-insect-pest-management-2024_MF745. For recent insecticide efficacy results, see Table 1 below.

Figure 1. Damaged brome field near Gypsum, KS, on September 10, 2024. Photo by Jay Wisbey, K-State Research and Extension.

Table 1. Efficacy trials to control armyworms in brome. DAT=days after treatment.

		Total worms/sq. ft (averaged over four replications)	
Treatment	**Rate**	**9/19/2021 (7 DAT)**	**9/26/2021 (14 DAT)**
Fastac CS	2.4 fl. oz/a	0	1
Besiege XL	8.0 fl. oz/a	0	2
Stallion	6.0 fl. oz/a	0	2
Grizzly Z	2.5 fl. oz/a	0	0
Lorsban 4E	1.5 pint/a	3	3
Check (control)	-	25	26
Check (control)	-	18	20

Jeff Whitworth, Extension Entomologist
jwhitwor@ksu.edu

10. Self-guided tours of herbicide evaluation plots are open near Manhattan

Each summer, the Extension Weed Science team evaluates herbicide programs for corn and soybeans. We are working to make these plots available for anyone interested in seeing the results for themselves. There's no need to wait for a field day announcement or invitation – you can visit the plots on your schedule.

If you'd like to see the plots, just take your friends and a smartphone to the fields east of the Ashland Bottoms Research Farm office building. The office is located at 2850 32nd Avenue, off of McDowell Creek Road (39.125517989358244, -96.6135178159968). You'll see a sign with a QR code to scan with your phone. That QR code will direct you to a website that hosts the treatment lists for the plots. If you want to preview the trial names and treatment lists, you can do so here.

Plots will be available through harvest.

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