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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. Pre-emergence herbicides for wheat

Pre-emergence herbicides with residual activity are an important component of high-yielding cropping systems. They are used less frequently in wheat production compared to other cropping systems in Kansas, but residual herbicides applied prior to wheat emergence can be part of a good weed management system in wheat production. Selected products for this use are described in Table 1.

Most residual herbicides labeled for pre-emergence application in wheat are Group 2 (ALS-inhibiting) herbicides, which are associated with herbicide resistant populations of kochia, marestail (horseweed), bushy wallflower, flixweed, henbit, and brome species in Kansas. Products in Groups 14 (the PPO-inhibiting herbicides) and 15 (the long-chain fatty acid inhibiting herbicides) are also labeled; however, they are generally more dependent on rainfall for activation than the Group 2 herbicides.

Herbicides without residual activity may be applied with or without residual herbicides in the weeks prior to planting wheat. Older products include the Group 2 herbicides Amber, Olympus, and Pre-Pare, as well as Group 4 (plant growth regulating) herbicides like 2,4-D, dicamba, or fluroxypyr. It is especially important to be aware of planting interval restrictions for Group 4 herbicides, which range from 10 to 45 days.

When selecting pre-emergence herbicides for use in wheat production, keep in mind that many of these products are also labeled for use in emerged wheat. Unless using a planned split-application, avoid repeated use of products from the same herbicide group to slow the development of herbicide-resistant weed populations in your fields.

Table 1. Select herbicides for pre-emergence or pre-plant applications in winter wheat.

Trade name	Common name	Herbicide group	Application timing*	Comments
Amber	Triasulfuron	2	BD, PRE or POST	Requires tank mix or sequential application of herbicide from different group
Anthem Flex	Pyroxafulfone + carfentrazone	15 + 14	DPRE	Plant wheat 1 – 1.5” deep
several	Dicamba	4	BD	Apply at least 45 days before planting wheat
Facet	Quinclorac	4	BD	Plant wheat at least 1” deep
Finesse	Chlorsulfuron + metsulfuron	2 + 2	PRE, POST	Suppression only of cheat, downy brome, and Japanese brome
Kochiavore	Fluroxypyr + bromoxynil	4 + 6	BD	Apply at least 30 days before planting wheat
Olympus	Propoxycarbazone	2	PRE, POST	Mix with glyphosate for BD
Outrider	Sulfosulfuron	2	PRE, POST	Apply after planting but before wheat emergence; If dry, apply POST
Pixxaro	Fluroxypyr + halauxifen	4 + 4	BD, POST	Do not use multiple applications or in successive years at the same

				site
Pre-Pare	Flucarbazone	2	BD, PRE	Mix with glyphosate for BD; Rainfall necessary for activation to control PRE
Quelex	Halauxifen + florasulam	4 + 2	BD, POST	Broadleaf weed control only
Scorch	Fluroxypyr + dicamba	4 + 4	BD	Apply at least 30 days before planting wheat
Sharpen	Saflufenacil	14	BD, PRE	Rainfall required for activation; Injury may occur to exposed wheat seed
Zidua	Pyroxasulfone	15	DPRE	Rainfall required for activation; Plant wheat 1 – 1.5" deep
several	2,4-D	4	PRE, POST	Apply at least 2 weeks after a 0.5" rainfall before planting wheat

*BD = burndown; PRE = preemergence to wheat and weeds; DPRE = Delayed preemergence application after wheat emergence; POST = postemergence

Field bindweed control

Field bindweed (Figure 1) is a particularly troublesome weed for which a special discussion is justified. In a 12-year experiment conducted at the Agricultural Research Center in Hays, field bindweed reduced wheat yield 2 to 50%. Management of this weed during wheat establishment is important because field bindweed continues to grow until temperatures drop below 20°F.

The herbicides most commonly recommended for field bindweed control include various formulations of 2,4-D, dicamba, and glyphosate. Dicamba tends to provide greater control for fall applications compared to 2,4-D or glyphosate, especially if plants are drought-stressed. Another commonly used product is Facet (quinclorac). It is most effective when applied just before the first killing frost. Other herbicides that are labeled for fall application to control or suppress field bindweed in wheat include Affinity, Aim, and Cimarron.

Satisfactory control of field bindweed will not be achieved with a single herbicide application. It will take multiple years of herbicide applications to deplete the energy stored in the root system and control an established infestation.

Figure 1. Field bindweed growing in a harvested wheat field. Photo by Sarah Lancaster, K-State Research and Extension.

For additional information, see the "2022 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide available online at https://bookstore.ksre.ksu.edu/pubs/SRP1169.pdf or check with your local K-State Research and Extension office for a paper copy.

The use of trade names is for clarity to readers and does not imply endorsement of a particular product, nor does exclusion imply non-approval. Always consult the herbicide label for the most current use requirements.

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2. Corn harvest efficiency - Adjusting combine settings

Corn has been growing in a hot and dry summer, which will certainly limit grain yield in 2022. Thus, adjusting combine settings can be very helpful in reducing yield loss during harvest operations.

Combine settings

Ground speed is one of the most important factors that a combine operator can control to improve harvest efficiency. By matching combine ground speed to crop throughput and harvest conditions, the operator can improve harvest efficiency. Excessive ground speed results in greater losses at almost all stages of the harvesting operation. Ground speed that is too slow may fail to keep the combine operating at full capacity, decreasing the threshing efficiency, and increasing the specific fuel consumption (gallons/bu).

Header loss

Header loss occurs when kernels do not make it into the machine. Both biological and mechanical factors contribute to header loss. Corn that has lodged or is too dry may shatter, causing whole ears to be lost. Deck plates that are set too widely may cause excessive butt shelling of the ears. Adjusting both the header speed and relative ground speed can reduce header loss; slower may be better.

To measure header loss, harvest a portion of the field and then place a marker toward the rear of the combine and in front of the tailings discharge. Back the machine up so that the front of the header is even with the marker. Grain on the ground in the area between the header and the unharvested portion of the field is due to header loss. To determine the loss per acre, count the number of kernels or ears on the ground between the front of the combine and the unharvested corn and estimate the yield loss.

Adjustments to minimize header loss

1. Adjust the gathering snouts so that the center snout is just touching the ground when the gathering chains are 2 inches above the ground. Working out from the center, each successive snout should be about 1 inch lower than the adjacent snout. Drive with the center snout just touching the ground. This will ensure that all snouts float at ground level when combining over rough ground.

2. Gathering chains should extend at least ¼ inch beyond the snapping plate when measured at the front of the plate. Control chain speed so that stalks are guided into the rolls without uprooting.

3. Snapping rolls should be set according to stalk thickness with speed correlated closely to ground speed so that the ear is snapped in the upper third of the roll. This helps reduce ear loss.

4. Deck plates should be set as wide as possible without losing ears or shelling corn off the ear. This reduces the amount of trash taken into the machine. The spacing between the plates should be 1/8 to 3/16 inch tighter at the front of the plates than at the rear. In highly variable crop conditions, paying close attention to deck plate spacing has one of the largest potentials for payback. Newer headers with automatic or hydraulically actuated deck plates have the potential to significantly reduce header losses.

5. Trash knives should usually be set as close to the rolls as possible to prevent wrapping.

Threshing loss and kernel damage

As with most other crops, cylinder or rotor adjustment has a great effect on corn quality. As much as 80% of corn kernel damage occurs during the shelling process, so careful management at this point will produce dividends throughout storage and drying. Moisture content has a large effect on the amount of damage, with fines increasing rapidly at high moisture. If possible, delay harvest delayed until moisture is between 20-25%.

Concave clearance and cylinder or rotor speed require careful adjustment, and although a great variation in hybrids exists, a few rules of thumb have been developed. Over-shelling the grain (by having the cylinder or rotor speed too high, or the clearance too tight) not only produces excess fines but also consumes excessive power and fuel. A good way to adjust the cylinder or rotor is to begin with the clearance and speed recommended by the manufacturer (or in the middle of the suggested range), then make small changes after checking the discharge of the machine.

Adjustments to minimize threshing loss and damage

1. Concave clearance should be set so that cobs fracture into halves or pie-shaped segments. If the cobs are broken into smaller halves or quartered pieces, higher cylinder or rotor speeds will be necessary to remove the grain, which in turn can contribute to grain damage, loss, and decreased sample quality.

2. Reduce cylinder or rotor speed to the point that an occasional kernel is left on the cob. Several studies have shown that the best compromise between unshelled grain and excessive kernel damage occurs when about 0.2% of the kernels remain on the cob.

Keep in mind that the most significant contributing factor to grain damage is cylinder or rotor speed. In addition to grain damage, excessive cylinder or rotor speed can lead to increased levels of foreign material in the grain sample.

Sieve and chaffer settings

Machinery settings can affect grain losses at the sieve and chaffer. Grain losses may be reduced by adjusting fan speed. If there is too much trash, the kernels stay in the trash through the straw walkers in a conventional combine or over the cleaning shoe in a rotary design. The kernels are then thrown out of the machine in the tailings. This can result in a windrow effect when the corn kernels germinate (Figure 1).

Figure 1. Windrowing effect from grain loss directly behind the combine. Photo by Gretchen Sassenrath, K-State Research and Extension.

Careful adjustment of the combine can improve this. If the air speed is too high, too many kernels are lost. Conversely, if air speed is too low, unnecessary foreign material is retained in the grain resulting in quality dockage at the point of delivery. Adjust chaffer and sieve to minimize grain losses in the tailings. Yield losses from cleaning operations can be measured by counting kernels behind the combine. Especially look for windrowing effects if an adequate spreader is not used.

Now is the time to prepare for harvest by getting equipment in optimal operating conditions. In addition to the combine losses described here, additional losses can occur during transfer events. While this may look substantial, it is usually not very high across the entire field.

A final consideration is to examine the efficiency of all crop harvesting operations. Because we have a long period of warm temperatures and the possibility of adequate fall rain, we could see the corn harvest losses as volunteer corn. Similar losses can occur during wheat and soybean harvests. However, these losses are often not as apparent as the losses during corn harvest. Improving crop harvest efficiency means more grain in the bin and less on the ground.

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3. Drought and heat stress in Kansas corn fields

Since the end of June, precipitation has been sporadic and uneven across the state of Kansas. In the central and western areas of the state, several corn fields under dryland conditions have been suffering a combination of drought and heat stress. High temperatures have been more frequent since the first weeks of July, exacerbating the drought effects on corn fields.

The latest USDA Kansas Crop Progress Report and Condition (August 8, 2022) rated topsoil moisture as 33% very short, 40% short, with only 27% adequate and 0% under water surplus. Corn condition was rated 38% under poor or very poor conditions, 32% fair, 24% good, and only 6% under excellent conditions. This exhibits a great contrast with the soil moisture and corn crops condition at the beginning of the season. Compared to the USDA report of early July (July 5, 2022), topsoil moisture was rated as 17% very short, 30% short, 50% adequate, and 3% surplus; while corn condition rated only 11% as poor or very poor, 32% fair, 45% good, and 12% excellent.

Entering July, corn fields started to experience very dry and warm conditions with a large proportion of the early-planted acreage for this crop already moving from vegetative to reproductive stages, right at or after flowering time. Since the growing season is progressing very quickly due to warmer than normal temperatures, it is best to be prepared to take a close look for symptoms of drought stress.

Common symptoms of drought stress

1. Leaf rolling

Leaf rolling is probably the first visible corn response to drought. When this symptom is observed already very early in the morning (when the plants are supposed to be under the lowest environmental demand for water), this is an indicator of a severe water stress. Leaf rolling is a plant defense mechanism to reduce transpiration and plant canopy temperature. Under continuous drought for several days, it is expected to observe reductions in leaf expansion, and stem elongation rate, impacting plant height.

Figure 1. Leaf rolling in corn under drought stress. Photos by Ignacio Ciampitti, K-State Research and Extension.

Figure 2. Leaf rolling in corn under drought stress during early reproductive stages. Photos by Ignacio Ciampitti, K-State Research and Extension.

2. Stunted growth

Shorter, less leafy plants are also among the most visible symptoms of drought in corn. In some cases, nitrogen movement within the plant and chlorophyll production could be negatively affected under water shortage. In parallel, smaller root systems are expected under drought conditions since the growth of all plant tissues (above- and belowground) will be impacted. The reduced plant growth is the combination of a reduction in the expansion of tissues as well as in the photosynthesis rates, which will result in overall less efficient crops.

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

3. Grain yield components

When entering the reproductive stages of corn, we are defining the most important yield components. The most important component is the number of kernels per unit acre, which is greatly determined around the pollination period (between 2 weeks before and 2 weeks after flowering -R1, silking). Therefore, corn is extremely sensitive to drought (and heat) stress conditions around flowering, which will directly affect the final number of kernels. Reductions in the number of kernels could occur due to:

- **Delays in appearance of silks** (asynchrony between the development of male and female reproductive parts). This happens when the tassel is shedding pollen but the ear is not yet receptive (silks are not yet out of the husk).
- **Potential reductions in ear size** (smaller ears with less physical space for bearing grains).

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

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

5. Even when pollination is effective, **kernel abortion or cessation** can still occur during blister (R2) and milk stages (R3), if drought (and heat) stress continues, producing the absence of grains at different portions of the ear. With kernels still aborting until several weeks after flowering.

Under extreme drought and heat stresses, plants may be barren, with no ears being formed at all, if conditions were severe well before pollination time.

Figure 4. Corn ears showing absence of grains at different sections as a result of combined drought and heat stress during the 2022 growing season. Agronomy North Farm, Manhattan, KS. Source: Ciampitti Lab.

Overall, reductions in potential yield can be expected whether the stress occurs early (10-leaf to 15-leaf stages) or late (dough and dent stages) in the crop growing season, but with a larger impact on yields when concentrated around flowering time.

4. Management practices and other factors

There are several management practices that could accentuate drought stress symptoms including high plant densities, narrow row spacing, and excessive applications of fertilizer or manure that could produce big plants excessively increasing the water consumption before the most critical period for yield around flowering.

Final considerations

The specific impacts on grain yield can be estimated using the yield components approach (https://bit.ly/3v5v9aC) with more accuracy after flowering, when we have the main yield component, the number of kernels, practically defined. If stress is impacting the final number of kernels, and if conditions for the coming weeks continue to be on the dry side, yield reductions can be expected also due to poor grain-filling conditions that may reduce the grain weight.

It is highly recommended to scout your acres for drought and heat stress so you can make timely decisions.

Finally, if you would like to report drought impacts to your region, anyone can submit **Condition Monitoring Observer Reports (CMOR).** These can have substantial impacts on the drought monitor assessment for your locale and provide invaluable data for future research/analysis of water and/or climate status. You can submit reports here: http://go.unl.edu/CMOR and view other's reports here: http://go.unl.edu/CMORMAP. To learn more about the Drought Monitor process, please visit https://bit.ly/3Q2UUke.

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4. Dryland corn considerations for 2022

Dryland corn in many parts of western KS is struggling. Some areas have been fortunate to receive rain showers that may result in more growth, but in other cases the plants are already dead and on the ground. Dry conditions are reducing production in both native pastures and forages typically used for winter feeding, so making some use of failed corn will help livestock owners to bridge the gap.

Elevated levels of nitrates are a common concern with drought-stressed plants. We sampled some dryland corn fields in Thomas County to assess current conditions. Fields 5 and 6 (Table 1) had the least growth and appeared the most drought stressed. Many plants in field 6 were on the ground whereas field 5 was similar in height but still green and upright.

Table 1. Plant growth characteristics of drought stressed dryland corn in Thomas Co. KS collected 7/27/22.

Field	Average Plant Height, in*	Average Leaf Number.**	Tasseling	% DM	Biomass lbs/acre, DM
1	35.9	14.4	Yes	33.3	5479
2	32.5	15.75	Yes	37.2	5531
3	24.6	12.4	Yes	51.7	6004
4	32.4	13	No	43.8	8271
5	9.2	6.3	No	67.3	1271
6	11.4	7.3	No	45.8	2254
7	18.8	9.3	No	29.3	2627

*Measured from ground to uppermost leaf collar or base of tassel, inches

** Number of leaves with a fully visible leaf collar

Nitrate concentrations in the lowest six inches of the plant were at a level considered dangerous to cattle and were greater than the portion above that point as expected (Table 2). Harvesting forage at 6 inches or higher avoids the greatest concentration of nitrates in the stem base. In the fields sampled, the portion above 6 inches contained nitrate concentrations in the safe category (<3000 ppm) except for field 7. Field 7 received 2.1 inches of rain in the 48 hours after the first sample. This moisture allowed the plant to mobilize nutrients and NO_3 levels in the plant above 6 inches increased 5 and 8 days after the first sample (Table 2), whereas levels decreased in the bottom 6 inches. If this field was being grazed, the recommendation would be to remove animals for 7 to 14 days after the rain. These data provide an example of what is out there but should in no way substitute for testing other fields before feeding or grazing.

Table 2. Nitrate concentration of dryland corn sampled in Thomas Co. KS, 7/27/22.

		Nitrate, $N0_3$ ppm	
	Crude Protein	7/27/22	
Field	Above 6″	Above 6″	≤ 6″
1	14.3	2677	30472

2	11.1	1051	25299
3	12.4	911	35015
4	11.8	727	21328
5	14.3	3029	30346
6	13.9	2271	28785
7 on 7/27	14.8	6365	76733
7 on 8/1	-	6728	55473
7 on 8/4	-	7133	47681

Weeds growing in two wheat stubble fields were sample and contained very dangerous levels of nitrates (Table 3). The top 12" of the plants were sampled in plants 2-3 feet tall.

Table 3. Nitrate concentration, NO_3 ppm, in weeds sampled in wheat stubble in Thomas Co. KS.

Sample	7/27/22	8/1/22
Kochia	14384	35786
Palmer amaranth	14083	10331

Depending on the stage of harvest and any grain produced, forage quality of drought-stressed corn is generally higher in crude protein and 70 to 90% of the energy value of normal corn silage. Even in tasseled fields, crude protein was over 11% in dryland fields sampled. Corn hay could be as good in quality or better than what is typically harvested for forage sorghum hay if adequately dried.

Grazing may be the best option when biomass is low if water and fencing logistics are workable, and grazable plant nitrate content is safe. The base of the plants in fields 5 and 6 were small enough that the entire plant may be consumed. In this case, the lower 6" is 30 -40% of the entire biomass which makes the nitrate level in the base more problematic. If harvested as silage, ensiling reduces the amount of nitrate in the plant by approximately half. Whereas, with haying, any nitrates in the plant at the time of swathing would remain unchanged as it dries and over time. Producers attempting to bale corn hay need to get a very good crimp on the stalk to aid drying. Corn stalks baled too wet can mold and even spontaneously combust. One South Dakota report from 2012 indicated it took 30 days for swathed corn plants to dry from 31.8% DM to 83.8% DM. Baleage may be an option in some areas although stalks may puncture the plastic wrap which would allow heating and spoilage.

Failed dryland corn may fill a gap for livestock producers with limited forage options. Testing prior to feeding will be particularly important with drought stressed plants. For more information, see K-State Research and Extension publication MF3029, "Nitrate Toxicity", at your local county Extension office, or at https://bookstore.ksre.ksu.edu/pubs/MF3029.pdf

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5. Summary of the 2022 wheat growing season in Kansas

Fall growing conditions

The month of September 2021 had an average of 2-3 inches of precipitation across the state of Kansas. In the western part of the state, this precipitation mostly occurred before September 15th. With moisture available, growers in western Kansas planted wheat fields fairly early to ensure good emergence and hopefully decent stand establishment in the fall. However, October was dry in the western portion of the state, with precipitation totals of less than one inch.

Western Kansas was also subjected to the first of several significant wind events on December 15. This caused damage to emerged crops and also removed large amounts of topsoil. Meanwhile, in central and eastern Kansas, October was wet, with above-normal moisture ranging from 2-3 inches. Unfortunately, after October, the entire state began a significant dry stretch that persisted into early 2022. The conditions mentioned above had two main consequences: 1) Fields in central Kansas emerged and established during the fall almost irrespective of planting date (with exception of very late-planted fields), and 2) fields in western Kansas that were planted in mid-October or later did not emerge until the next precipitation event, which did not happen until the spring. Temperatures during the fall were 4-6 degrees warmer than average, increasing the amount of forage biomass produced by early-planted wheat crops when moisture was available (Figure 1).

Figure 1. Large biomass production in a dual-purpose wheat trial near Hutchinson, KS. The trial was sown on 21 September 2021, with 50 lbs DAP/acre applied in furrow and photo was taken mid-December 2021. Weeds were controlled the week prior to sample collection, thus control is still incipient in the photo above. Photo by Romulo Lollato, K-State Research and Extension.

Winter growing conditions

Opposite to the conditions experienced in the fall, temperatures were 1-4 degrees colder than the long-term average during the January 1 – March 31, 2022 period. Dry conditions continued across the state with only east central Kansas observing near-normal rainfall during this period. Average precipitation for the remainder of the state was about an inch below normal, with greatest departures in the southwest. The combination of dry and cool conditions extended the dormant period of the wheat crop. The majority of the varieties evaluated by K-State Research and Extension did not reach the first hollow stem stage of development until March 26 in Hutchinson, which compares to as early as March 6 in years with a warmer winter. Strong winds continued to be an issue with wind erosion and occasional crop damage as a result.

Early spring 2022 growing conditions

The spring started with freezing temperatures during the first two weeks of April, when as many as 11 hours below 32 degrees were accumulated. As the majority of the wheat in central, south central, and southwest Kansas were already going though stem elongation, these freezing temperatures caused low levels of freeze damage to wheat in these regions (Figure 2). The cool and dry conditions experienced during the winter extended until the first week of May, overall delaying the reproductive development of the crop and leading to severe drought stress. In addition to the drought stress, the second week of May was extremely hot, with temperature averages as many as 9-12 degrees above the long-term average for the period in parts of central, south central, and southwest Kansas. This heat stress caused fields to show symptoms of heat scorching in parts of south-central and southwest Kansas (Figure 3).

Figure 2. Leaf damage due to cold winter temperatures in early planted wheat (left) as compared to later planted wheat (right) near Hutchinson, KS. This photo was taken on March 2022, by Romulo Lollato, K-State Research and Extension.

Figure 3. Field in southwest Kansas showing signs of head scorching likely due to heat stress. Photos taken by Romulo Lollato, K-State Research and Extension.

The combination of season-long drought stress and a short period of extreme heat stress in mid-May resulted in several wheat fields in the western portion of the state (west line from Smith to Pratt counties) showing severe symptoms such as younger leaves curled, abortion of older leaves, and yellowing of lower canopy, extremely reduced plant height and biomass, and a delayed development that accelerated through the flowering period due to the heat stress (Figures 4 and 5). Many of the fields across western Kansas were into the reproductive stages of development (flowering and grain elongation) only measuring 9-12 inches tall due to the prolonged stress. From a regional perspective, the worst crop conditions occurred in far southwest Kansas, where season-long drought stress impacted the crop worse than in other regions. However, severely drought-stressed crops occurred as far east as Pratt county. From a cropping systems perspective, the extreme drought caused large differences in the yield potential of the wheat crop as function of previous crop and the presence of a fallow period. In central Kansas, wheat fields planted after a previous wheat or canola crop were showing much better yield potential than wheat fields planted continuously after a soybean crop. These differences were even more apparent in the western portion of the state, where wheat planted after a long-term fallow period may have had a 50-60 bushel per acre yield potential, as compared to a 15-20 bushel per acre yield potential in continuous wheat (3-month fallow), versus a failed crop on wheat after corn (no fallow).

Figure 4. Drought-stressed wheat fields in Norton county, Kansas. Symptoms include decreased crop biomass production and height, curled leaves, abortion of older leaves, and yellowing of lower canopy. Photos taken by Romulo Lollato, K-State Research and Extension.

Figure 5. Drought-stressed wheat fields in Kearney county, Kansas. Symptoms are similar to those in the photos above: decreased crop biomass production and height, curled leaves, abortion of older leaves, and yellowing of lower canopy. Photos taken by Romulo Lollato, K-State Research and Extension.

Grain-filling period

Departure from average precipitation continued below normal in the western portion of the state during the remaining of May and June. Only isolated areas received average rainfall which helped the wheat crop maintain yield potential in these selected locations. In central Kansas, precipitation amounts during the remaining of May and during June were above normal, with areas observing almost double their average moisture. While this may have been excessive and lead to waterlogging in some specific regions of central Kansas, for the most part this precipitation was beneficial and helped the crop during the grain-filling period. These conditions were coupled with below-average temperatures in late May and early June, and slightly above-average temperatures during the entire month of June. Combined, precipitation and temperature regimes after the initial heat stress of mid-May were near ideal for grain yield development, ensuring some grain production despite an already limited yield potential due to the season-long drought stress.

Wheat disease summary

Overall, yield losses to disease were lower than average during the 2021-22 growing season. That being said, there was an above-average amount of wheat streak mosaic virus in central and southwest Kansas (Figure 6). This outbreak could have been partially driven by rainfall in September (leading to an increased amount of volunteer wheat prior to planting) and warmer than average fall temperatures (potentially keeping curl mites active longer). Although many infections likely took place in the fall, symptoms were not apparent in most central Kansas locations until the weather warmed in May.

In addition to wheat streak mosaic virus, barley yellow dwarf virus was also present statewide in moderate levels. Stripe rust remained at trace levels this season in Kansas. Stripe rust was likely suppressed due to low overall regional inoculum (low disease levels in Texas and Oklahoma), unseasonably dry weather through April, and above average temperatures in May. Leaf rust levels also remained trace this season. Fusarium head blight was detectable in eastern Kansas, particularly in fields with corn residue, but levels remained generally low. Common bunt, also known as stinking smut, has emerged for a third season as a problem for many producers after harvest.

Figure 6. Field affected by wheat streak mosaic virus in southcentral Kansas in 2022. This image shows a typical field pattern, where symptoms are most severe at the field margin (where the curl mites migrated in) and improve as you move away from the curl mite source. Photo taken by Kelsey Andersen Onofre, K-State Research and Extension.

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6. Kansas Wheat Variety Guide 2022 now available

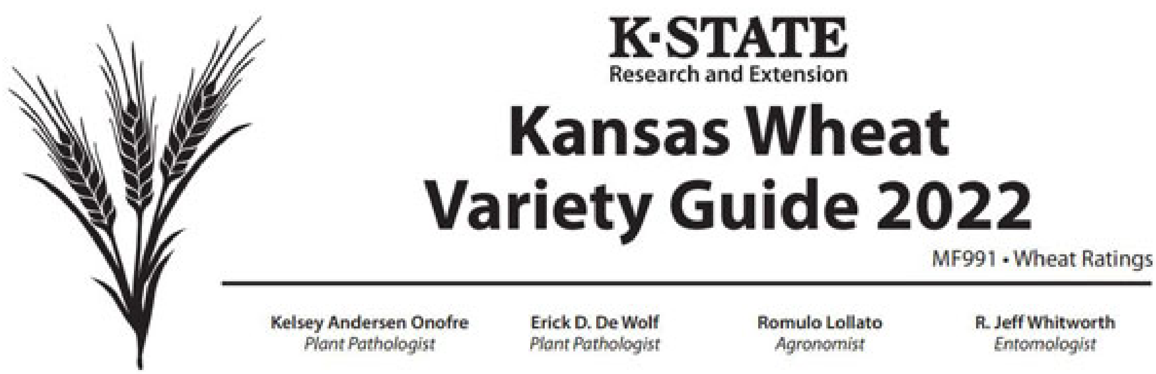
Variety selection is one of the most important decisions that a grower can make to ensure success on their farm. Now is the time when wheat producers across Kansas are reviewing yield data and making decisions about the varieties they will plant in the fall. Although yield is always a top priority, disease and insect resistance, along with appropriate agronomic traits, can buffer against crop losses. In addition, genetic resistance to diseases and insect pests can be the most effective, economical, and environmentally sound method for control.

The Kansas Wheat Variety Guide 2022 (formerly called *Wheat Variety Disease and Insect Ratings*), from K-State Research and Extension, has now been released for this year. Agronomic characteristics, disease, and pest resistance information is included, as well as profiles that highlight some more common or new varieties for the state of Kansas.

Updates this year include the addition of variety profiles for varieties KS Hamilton, KS Ahearn, LCS Revere, as well as disease, insect, and agronomic ratings for several other new varieties.

Ratings in this publication represent results from field and greenhouse evaluations by public and private wheat researchers at multiple locations over multiple years.

An electronic version of the *Kansas Wheat Variety Guide 2022* MF991 can be found here: https://www.bookstore.ksre.ksu.edu/pubs/MF991.pdf



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7. Kansas Ag-Climate Update for July 2022

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

July 2022: Heat stress in western Kansas

The statewide average temperature in July was 81.0°, or 2.1°F above normal (Fig. 1). This ranks as the 25th warmest out of 128 years. Western Kansas was most above normal, where departures ranged from +3.2 to +3.8°F. Northeast Kansas was the only climate division below normal (-0.5°F). The three-month statewide average temperature (May to July) was 1.9°F above normal, which ranks as the 20th warmest on record.

Precipitation averaged 2.91 inches across the state in July, or 87% of normal. This ranks as 53rd driest out of the last 128 years. Southeast and south central Kansas had roughly half their normal precipitation, averaging 1.7 to 1.9 inches for July.

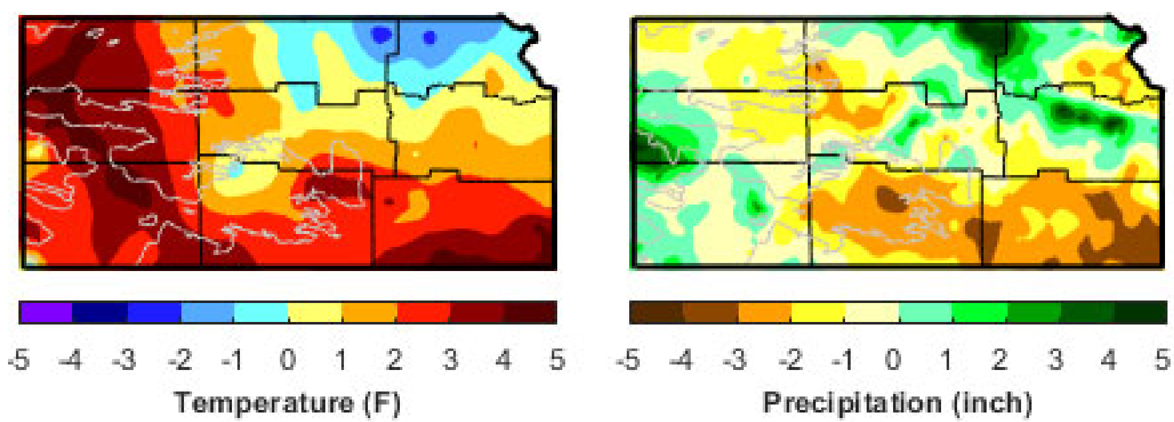

Figure 1. Departures from normal temperature (°F) and precipitation (inches) for July 2022.

View the entire July 2022 Ag-Climate Update, including the accompanying maps and graphics (not shown in this short summary), at http://climate.k-state.edu/ag/updates/

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