Issue 967

K-STATE Research and Extension

Extension Agronomy

# eUpdate

*07/27/2023*

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. Corn development in Kansas during recent high temperatures

Kansas is in the midst of an impressive heat wave and the impacts to agriculture and corn in particular are of concern. According to the USDA National Agricultural Statistics, the percentage of corn reaching silking has increased to 68% as of July 24, 2023, ahead of the average of 59% for the same period (Figure 1).

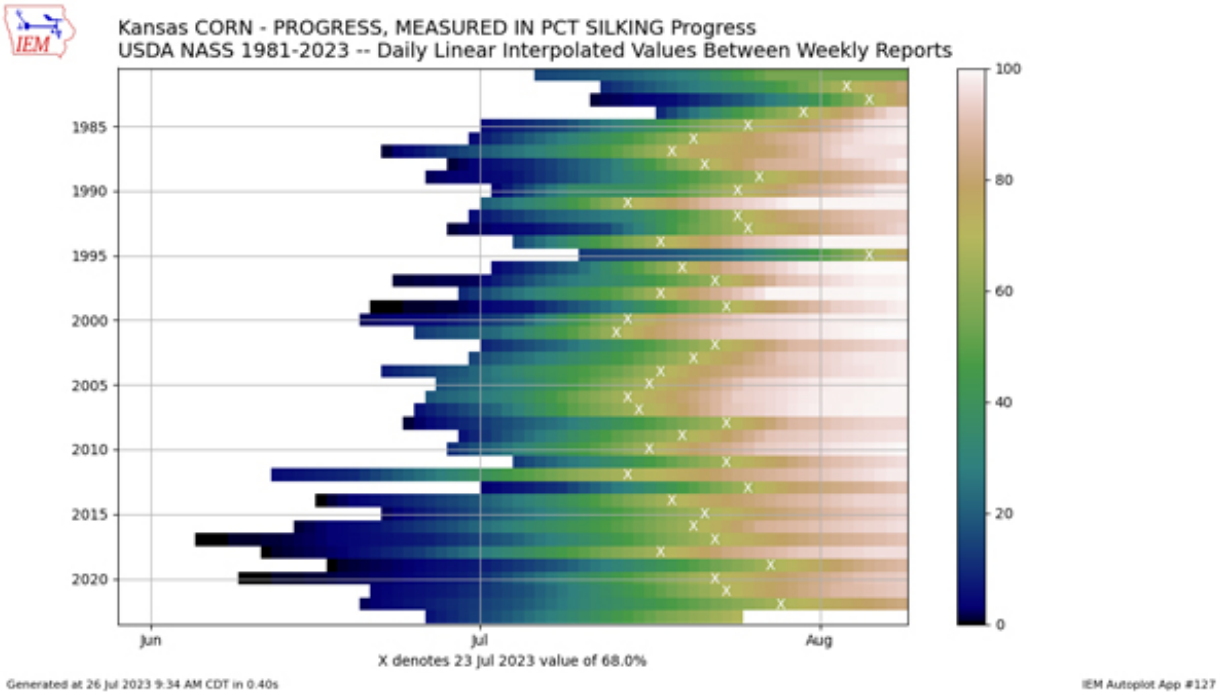


**Figure 1. Kansas's average progress of corn at the silking stage since 1981. Source: NASS/IEM.**

July has observed moderate weather conditions with moisture and at/below normal conditions throughout most of the month. However, in the last week, conditions have flipped significantly. The number of 100°F days has greatly increased (and is forecast to continue) with the focus of the most intense heat in Ness City/Jetmore. That area has measured as much as 7-8 days with high temperatures at/exceeding 100°F since June 1 (Figure 2). This is behind last year when some locations had seen 20+ days. Overnight lows have also been above 70°F which would compound the heat stress on corn (Figure 3). Higher humidity in central and eastern Kansas has resulted in fewer days of lows exceeding 70°F than last year. However, central locations have seen up to 10 days of lows greater than that threshold.

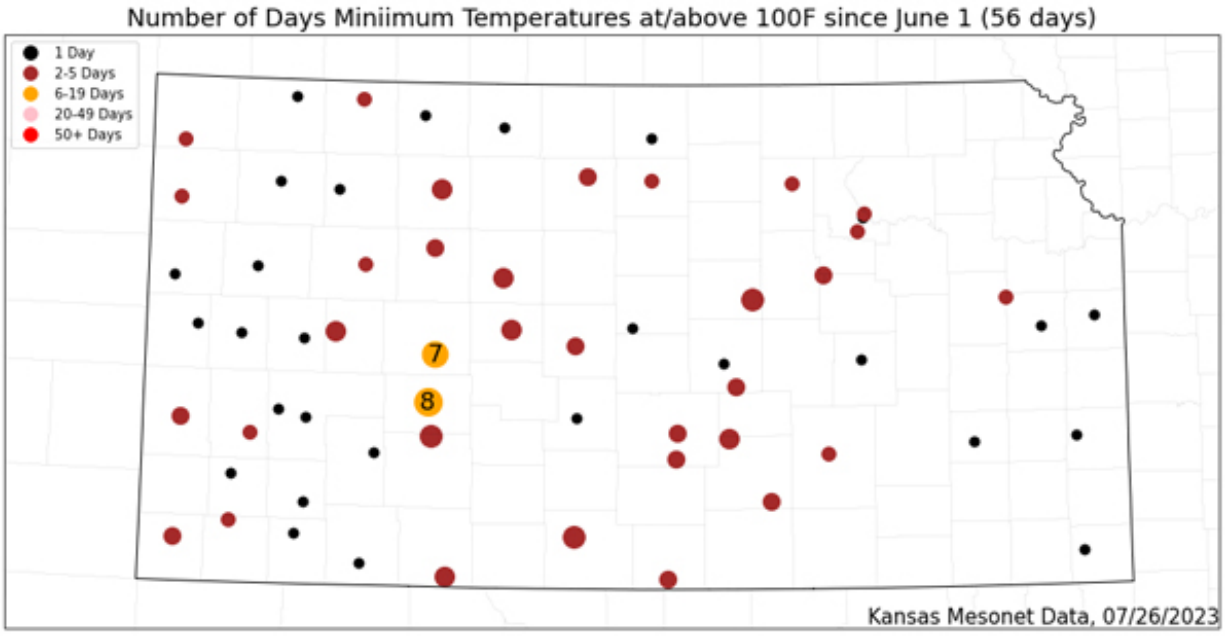


**Figure 2. Total days with a maximum temperature greater than 100°F since June 1, 2023. Source: Kansas Mesonet**

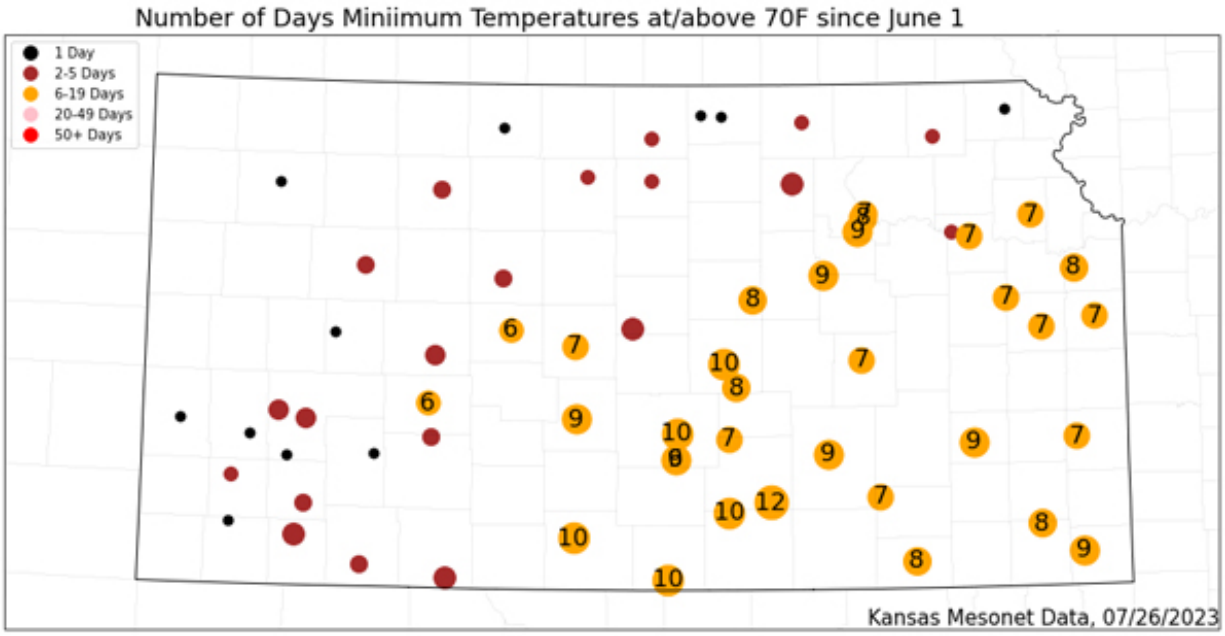


**Figure 3. Total days with minimum temperature greater than 70°F since June 1, 2023. Source: Kansas Mesonet**

Heat stress will have more of an impact on corn at this stage of growth when combined with drought stress. Even in the absence of drought stress, heat stress alone can still increase the asynchrony (disrupted timing) between pollen shed and silk extrusion when corn reaches flowering time, ultimately reducing the final number of kernels (Figure 4). In addition, if stress conditions are

prolonged, those effects will be reflected in a larger kernel abortion and impact the final size and kernel weight, negatively impacting final yields.

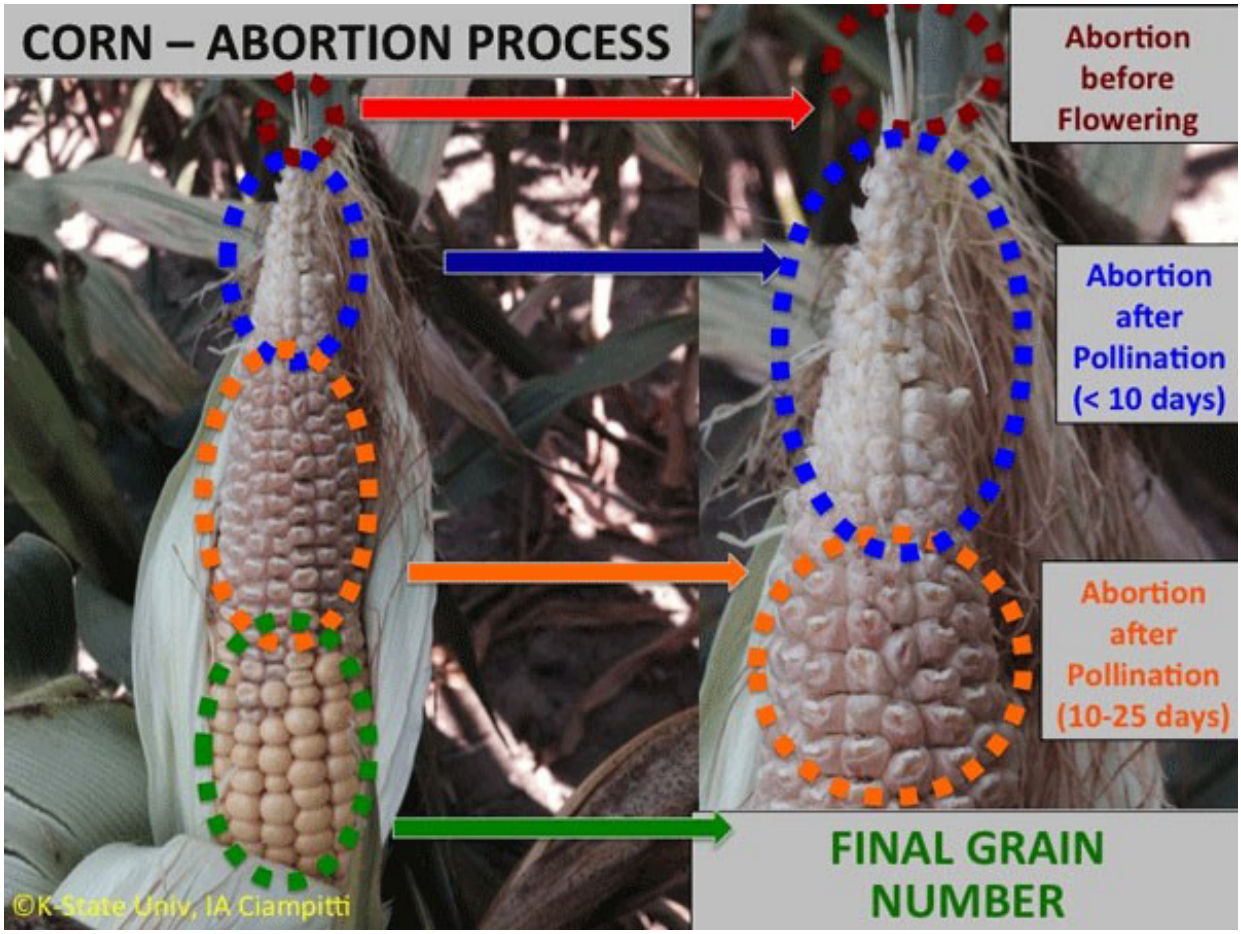


**Figure 4. Ear abortion in corn from the combined effect of heat and drought stresses at the critical period around flowering. Photo by Ignacio Ciampitti, K-State Research and Extension.**

**Growing Degree Day tool on Kansas Mesonet**

The Kansas Mesonet has a useful tool that tracks growing degree accumulation for multiple crops. With this tool, you can pick the planting/emergence date for the start of the interval. Selecting the graph will illustrate the growing degree accumulation for this season versus normal and the plant stage. You can access the page at: https://mesonet.k-state.edu/agriculture/degreedays/. You can also access the Maximum and Minimum temperature data here: https://mesonet.ksu.edu/weather/maxmin. Mesonet data updates in real-time with data from 79 weather stations.

**Grain abortion from heat and drought stress in 2022**

The following example depicts the occurrence of grain abortion resulting from a combination of heat and drought stress during various reproductive stages in corn plots at the K-State Agronomy North Farm in 2022 (Figure 5). The picture shows the upper section of the corn ears with several grains

aborted. This grain abortion is due to multiple processes, including sterility of flowers, lack of pollination, pollination but lack of effective grain formation, and grain formation but late abortion (after pollination), all mainly due to heat and drought conditions. The failure of pollination is mainly due to an asynchrony between pollen availability for the last silks emerging (from the tip of the ears). However, it also shows pollination failures at the middle and base of the ears, indicating issues with pollen viability due to heat stress (Stress Degree Days totaled around 170-200 around R1).

Besides the heat stress starting right before the VT stage, the crop also started to suffer from drought conditions due to the absence of rainfall during the reproductive stages. This combined stress (both heat and drought) caused additional grain abortion during the R2-R3 stages, even after successful pollination (upper-middle section of the ears). As demonstrated in Figure 4, grain abortion can occur several weeks after pollination, affecting not only grain number but likely the maximum grain weight as well.

Comparing the current season to 2022, we observe that although stress levels are above the average (Figure 5) for corn planted in early May, stress degree days accumulation in 2023 is far below the 2022 season. Therefore, we may expect to see fewer grain abortion issues in 2023.

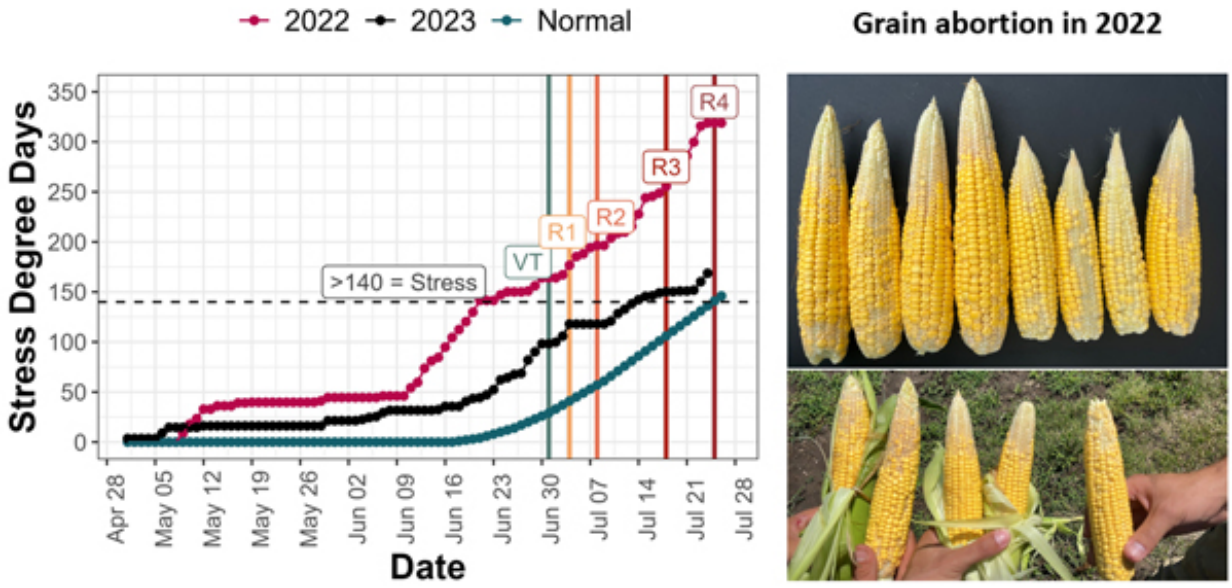


**Figure 5. Corn ears at R4 stage (dough) showing grain abortion at different sections due to heat and water stress at variable moments during reproductive stages, since VT (tasseling). Corn plots were planted at the North Farm (Manhattan, KS) on May-01-2022. Photo source: Ciampitti Lab. Precipitation (PP) and Evapotranspiration (ETo) source: https://mesonet.k-state.edu/weather/historical/. Stress Degree Days source: https://mesonet.k-state.edu/agriculture/degreedays/.**

**Final considerations**

Stress conditions were very severe in parts of central, south central, and southeast Kansas, compromising yields and presenting a large impact on potential productivity. Farmers should scout their fields and perform yield estimates (https://bit.ly/3PJw9JN) and consider making a decision on

the crop for the coming weeks. Stay tuned for more information on the effects of stress conditions on corn fields across the state.

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## 2. Dual-purpose wheat variety performance 2023

An updated publication is now available in the Wheat Rx series that examines the performance of several wheat varieties grown for use in a dual-purpose system (grazing and grain). To be successful in dual-purpose systems, wheat varieties require traits sometimes overlooked in grain-only systems. These include fall forage yield, date of first hollow stem, grazing recovery potential, resistance to viral diseases transmitted when the crop is planted early, no high-temperature germination sensitivity, long coleoptile, and greater tolerance to low soil pH and aluminum toxicity. This publication evaluates fall forage yield, date of first hollow stem, plant height, grain yield, and test weight of varieties in a dual-purpose system versus a grain-only system.

This article summarizes information from the publication. The full publication, *MF3312 Dual-Purpose Wheat Variety Performance*, is available online at: https://bookstore.ksre.ksu.edu/pubs/MF3312.pdf. Wheat Rx is a partnership between Kansas Wheat and K-State Research and Extension to disseminate the latest research recommendations for high-yielding and high-quality wheat to Kansas wheat farmers.

**Fall forage yield** is an important trait in dual-purpose systems because it sets the potential beef production from wheat grazing in the fall, winter, and early spring. Approximately 100 pounds of beef per acre can be produced for every 1,000 pounds of wheat forage produced in an acre. Forage production is dependent on variety, planting date, seeding and nitrogen rates, and fall temperature and precipitation.

**Date of first hollow stem** is also an important trait in dual-purpose systems because terminating grazing at the right time is essential to maintain the grain yield potential for subsequent harvest.

Grazing past first hollow stem can decrease wheat grain yield by as much as 1 to 5% per day.

Depending on environmental conditions, varieties with a shorter **vernalization requirement** might reach first hollow stem 15 to 20 days earlier than varieties with a longer vernalization requirement. An earlier occurrence of first hollow stem reduces the grazing window into early spring. The date of first hollow stem is dependent on temperature and day length.

**Grain yield** following grazing is another variety-specific trait of importance in dual-purpose systems. Varieties that rely mostly on fall-formed tillers to produce grain yield generally show a greater yield penalty due to grazing than varieties with a good spring tiller potential.

**Description of site and methods**

Twenty-one commonly grown winter wheat varieties, as well as pre-release lines, were sown in three neighboring trials in the South Central Experiment Field near Hutchinson, Kansas. Two trials were sown to simulate dual-purpose management, characterized by an early sowing date, increased nitrogen rate, and higher seeding rate; while a third trial was sown using the same varieties under grain-only management. More information on the experiment methods and site characteristics can be found in the publication.

**Fall forage yield**

Fall forage production of the varieties evaluated ranged from 213 to 679 pounds of dry matter per acre, averaging 354 pounds of dry matter per acre (Table 3). There were significant statistical differences among the varieties, with the highest forage producers being Guardian and KS Ahearn (489 – 679 pounds of dry matter per acre), followed closely by AP Prolific, LCS Atomic AX, and LCS Galloway AX (about 450 pounds of dry matter per acre).

**First hollow stem**

First hollow stem is reported in day-of-year format (for example, day of year 80 is March 21). The average occurrence of first hollow stem was day 91 (see Table 3 in the publication), ranging from day of year 85 for early varieties to day of year 92 for late varieties. These dates represent a fairly late release from winter dormancy, which was due to prolonged cold temperatures and dry winter conditions. The earliest varieties to reach first hollow stem were LCS Atomic AX and KS Hatchett. The latest variety to achieve first hollow stem was Whistler. All varieties reached first hollow stem within a 7-day interval. Reports of first hollow stem from Oklahoma have shown that early varieties may reach first hollow stem as much as 30 days earlier than later varieties, depending on environmental conditions. Kansas results may differ from Oklahoma results due to cooler winter temperatures holding crop development across varieties, and the interaction with photoperiod.

**Plant height**

Varieties and cropping systems also differed significantly in plant height (see Table 3 in publication). Plant height in the grain-only system averaged 22.9 inches, ranging from 19.2 to 28.0 inches. This average was only an inch taller than the average of all varieties in the dual-purpose system (21.9 inches). The range in plant height was narrower in the dual-purpose system, with varieties ranging from 19.4 to 25.9 inches. The tallest variety was Whistler at both management systems.

**Grain yield and grain test weight in grain-only or dual-purpose systems**

The average grain yield in the grain-only trial was 51.0 bushels per acre, whereas the dual-purpose trial averaged 48.9 bushels per acre (see Table 4 in publication). The weather conditions — characterized by severe drought across the season with cool and moist conditions after May 15 – were beneficial to late-maturing varieties across both systems. Varieties that yielded statistically better than counterparts in the grain-only trial were LCS Steel AX and Whistler. The yield penalty from simulated grazing averaged 2.1 bushels per acre and ranged from a positive gain of 3.6 bushels per acre to a loss of 7.5 bushels per acre. Varieties included in the highest-yielding group of the dual-purpose trial were CP7869, LCS Steel AX, and Whistler.

The only variety with the highest test weight at both grain-only (average: 60.8 pounds per bushel) and dual-purpose (average: 60.8 pounds per bushel) systems was Guardian, whereas the varieties CP7050 AX, CP7869, and LCS Atomic AX were in the highest test weight group under dual-purpose (see Table 4 in publication).

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## 3. Coleoptile length of winter wheat varieties 2023

An updated publication is now available in the Wheat Rx series that examines the coleoptiles lengths of many Kansas wheat varieties. Wheat varieties with long coleoptiles are more likely to emerge when planted deep enough to reach soil moisture from past rainfall. This article summarizes information from the publication. The full publication, *MF3612 Coleoptile Length of Winter Wheat Varieties 202*3, is available online at: https://bookstore.ksre.ksu.edu/pubs/MF3612.pdf.

Wheat Rx is a partnership between Kansas Wheat and K-State Research and Extension to disseminate the latest research recommendations for high-yielding and high-quality wheat to Kansas wheat farmers.

**Coleoptile Length**

Once a wheat seed starts to absorb water, the seminal roots are the first developmental structure to emerge. After the seminal roots, the coleoptile develops. The coleoptile is a rigid protective structure that covers the emerging shoot to aid it in reaching the soil surface (Figure 1). The coleoptile usually continues to elongate until it breaks the soil surface and reaches sunlight. At this point, it stops growing and the first true leaf emerges through it.

If the seed is sown deeper than the coleoptile's length, the coleoptile is not able to emerge through the soil surface, and consequently, the first true leaf emerges below ground. This causes the first true leaf to take on an accordion-like appearance and the wheat plant typically becomes yellow and dies (Figure 1). To avoid this situation, wheat should never be sown deeper than the coleoptile length of the chosen variety.

**Figure 1. Deep-sown wheat demonstrates the potential for coleoptile elongation (yellow arrows point to the end of the coleoptile). On the left, the coleoptile was able to reach the soil surface and the first true leaf emerged above ground, therefore showing normal early development. On the right, the coleoptile's maximum length was shorter than the sowing depth, resulting in the emergence of the first true leaf below the ground level. As the first true leaf does not have the strength to continue pushing upwards when it emerges below ground, it takes on an accordion-like shape and becomes yellow, leading to plant death.**

In dryland environments typical of western Kansas and eastern Colorado, wheat is often sown on soil moisture accumulated in the last summer rainfall events, which requires growers to sow deep in order to reach moisture. This is less of a concern in central Kansas during most years, where growers can achieve good stands by relying on fall precipitation for good topsoil moisture at sowing time.

To achieve good crop establishment on deep-placed seed, long coleoptile varieties are essential. An additional concern in these regions is that many growers sow their wheat early for grazing, which places sowing time during warmer soil temperatures – which further reduces the coleoptile length.

Depending on the variety, this reduction in coleoptile length due to high temperatures may be as much as 60%. For example, a variety that has a 27/8-inch (75 mm) coleoptile at 60°F could have a 15/8-inch (40 mm) coleoptile at 80°F soil temperature. While different varieties have different sensitivities to warm soil conditions, selecting varieties with longer-than-average coleoptiles could help prevent emergence issues under these conditions.

To help guide variety selection for deep sowing, this publication provides growers with an estimate of the average coleoptile length of different winter wheat varieties common to Kansas and the Great Plains.

**Description of Procedures**

This study was performed under controlled conditions, which differ from field conditions but provide a fair comparison among the different wheat varieties' potential coleoptile lengths.

Seeds were tested from all varieties entered in the 2022-23 Kansas State University winter wheat variety performance tests, as well as from other seed sources used for agronomic studies during the same crop year. Sixty seeds of each variety were tested. Variety randomization ensured that the experiment was conducted in a randomized complete block design and each variety occurred one time and that the coleoptile length was measured in 40 plants per variety.

**Coleoptile Length of Winter Wheat Varieties**

Results from this controlled-environment experiment are shown in Table 1. The longest coleoptile varieties ranged from 23/4 to 33/8 inches (72 to 87 mm) and included Kivari AX, AG Icon, Bob Dole, KS Providence, and DoubleStop CL Plus. Some of these varieties were also in the longest coleoptile group in the 2022 report (i.e., Kivari AX, KS Providence, Bob Dole, and DoubleStop CL Plus), reinforcing the argument for their long coleoptile. Varieties may have changed groups between their ratings in the last report as compared to this report. This is possible due to differences in seed treatment used between years, and also due to different season-specific conditions under which the varieties were cultivated.

Several variety options were also included in the second and third longest coleoptile groups (namely "Long" and "Medium-long" in Table 1) and could potentially be good options for deep sowing in western environments, as their coleoptile length ranged from 23/8 to 23/4 inches. Alternatively, many varieties had relatively short coleoptiles, falling in the two lowest groups (less than 21/8 inches (55 mm)). These varieties included: Larry, AM 525, KS DH0010-17, Becks 732 LCS 19DH-152-6, Bakers Ann, AP Roadrunner, Bentley, Duster, AM 535, and WB4792. Use caution when sowing these varieties in deeper than average conditions; and note that seed purity and vigor can influence coleoptile length. Wheat seeds were submitted for testing in the official wheat variety testing program at Kansas State University, there was no effort to ensure all seeds met minimum purity or vigor requirements.

**Table 1. Wheat variety grouping based on coleoptile length measured in a controlled environment experiment during the 2023 winter wheat season in Kansas. A total of 40 coleoptiles were measured per variety. Within groups, varieties are ordered from shortest to longest coleoptile.**

**Coleoptile Length**

| Very short (1¾ – 2⅛") (46 – 53 mm) | Short (2⅛ – 2¼") (53 – 55 mm) | Medium short (2⅛ – 2⅜") (55 – 62 mm) | | Medium long (2⅜ – 2⅝") (62 – 67 mm) | Long (2⅝ – 2⅞") (67 – 72 mm) | Very long (2⅞ – 3⅜") (72 – 84 mm) |
|---|---|---|---|---|---|---|
| Larry | Duster | WB 4523 | LCS Atomic AX | AG Golden | WB 4269 | Kivari AX |
| AM 525 | AM 535 | KS Hatchett | Tatanka | KS 19H10 | Canvas | Ag Icon |
| KS DH0010-17 | WB 4792 | AM 516 | CP 7869 | Ag Radical | AP 18 AX | Bob Dole |
| Becks 732 | | Gallagher | SY Monument | AP Bigfoot | Green Hammer | KS Providence |
| LCS 19DH-152-6 | | Showdown | AP EverRock | LCS Galloway AX | OK 18510 | Doublestop CL Plus |
| Bakers Ann | | OK 15MAS Bx7 ARS 8-29 | LCS White Lightning | Paradise | ARMOR EXP 6 AX | |
| Bentley | | KS Hamilton | AM 514 | LCS Chrome | WB 4401 | |
| | | WB 4422 | LCS Valiant | LCS Steel AX | SY Rugged | |
| | | Becks 720 | WB4303 | KS Dallas | KS Silverado | |
| | | KS Big Bow | OK Corral | AM 505 | CP 7266 AX | |
| | | Becks 722 | CP 7017 AX | CP 7909 | AP Prolific | |
| | | Becks 724 | Zenda | Whistler | Strad CL Plus | |
| | | Breakthrough | Joe | Langin | | |
| | | WB 4699 | AM 513 | Rock Star | | |
| | | High Country | AM Cartwright | SY Wolverine | | |
| | | KS Territory | MS Maverick | CP 7050 AX | | |
| | | AM 503 | LCS Julep | WB 2606 | | |
| | | Becks 725 | KS Ahearn | | | |
| | | KanMark | LCS Helix AX | | | |
| | | Smith's Gold | Everest | | | |
| | | ARMOR EXP 55 | WB 4595 | | | |
| | | KS Western Star | WB 4632 | | | |
| | | OK 16103083 | | | | |

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Mariana de Oliveira Mota, Visiting Scholar

Marinara Ferneda Ventorim, Visiting scholar

Juan Podesta, Visiting Scholar

## 4. Kansas Wheat Variety Guide 2023 is 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 2023* (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 are 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 AP Bigfoot, KS Territory, KS Providence, and Strad CL + 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 *Wheat Variety Disease and Insect Ratings 2021* publication MF991 can be found here: https://www.bookstore.ksre.ksu.edu/pubs/MF991.pdf


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## 5. Western bean cutworm activity in Kansas

Western bean cutworms are primarily a pest of corn in Kansas and activity is generally isolated to the western part of the state. This pest overwinters as pre-pupa in the soil in earthen cells about 3 to 9 inches deep. The moths begin emerging in southwestern Kansas in early June (early July for northwestern Kansas), usually around the time that corn is just starting to tassel (Figure 1). White eggs are laid in masses on the upper surface of leaves and gradually turn purple as they get closer to hatching (Figure 2). After about a week, the eggs hatch, and caterpillars enter corn ears to feed on the developing kernels. Mature caterpillars exit the corn ears and enter the soil to overwinter. There is a single generation of this pest each year.


**Figure 1. Adult western bean cutworm moth. Photo by Adam Sisson, Iowa State Univ., Bugwood.org**


**Figure 2. Maturing western bean cutworm eggs. Photo credit: Marlin Rice.**

Pheromone trap counts of western bean cutworm moths are not a metric for determining losses in corn, but can be utilized to help detect when moths start to emerge from the soil in order to properly time scouting efforts. Early detection of egg masses is important, as any chemical control if warranted, needs to happen before larvae enter corn ears. When the field is almost fully tasseled, an average of 8 % of plants with eggs or small caterpillars justify control measures. Control will be reduced if applications are delayed until all silks have emerged or if larvae have already entered the ear tips.

Currently, trap counts indicate that the western bean cutworm flight is winding down in southwest Kansas. Western Bean Cutworms began to emerge in the southwest during the second week of June and counts were low throughout the month (Figure 3). So far in July, 260 western bean cutworms have been captured in traps in Finney county with the peak weekly catch of 122 moths occurring during the first week of July. The number of captured moths is 60% lower going into the last week of the month. In Finney County, the 2023 flight is much less noticeable than in 2022 when moth counts were 64% higher. The total catch for July in Meade County is 178 moths (Figure 4) and the area is trending similarly with a peak capture of 92 moths occurring during the first week of July and trap counts are currently decreasing. The moth flight should conclude in the southwest in early August. Until then, any at-risk fields should continue to be scouted.

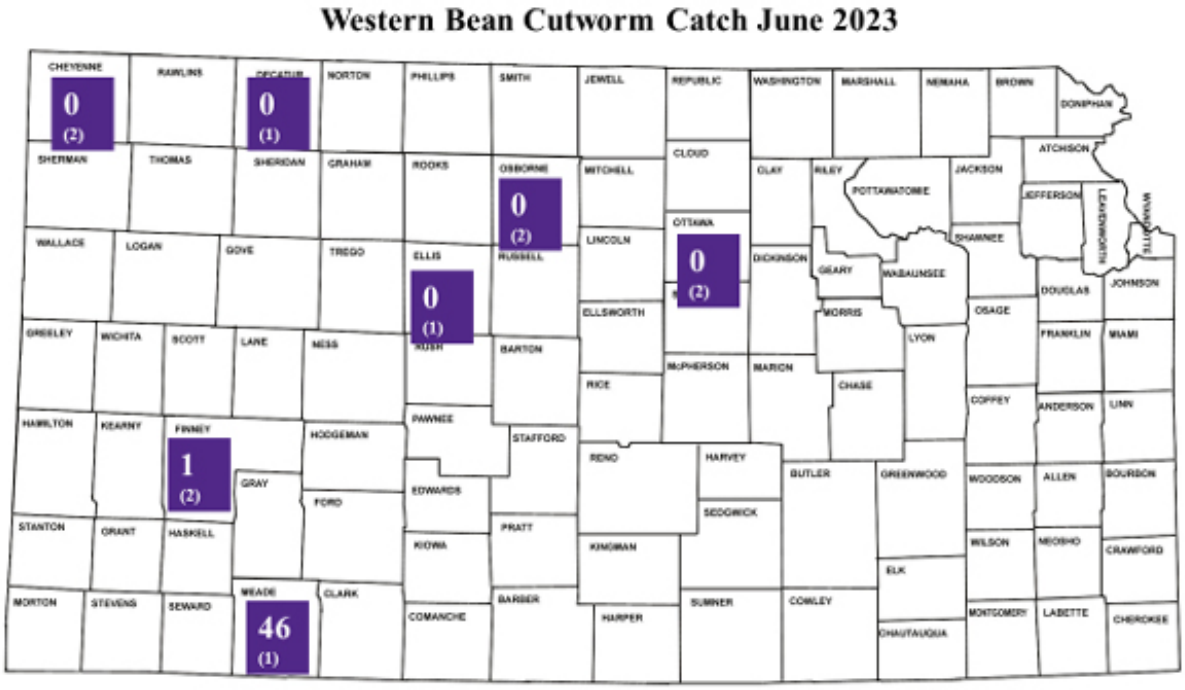


**Figure 3. Total western bean cutworm moth captures in June. The number in parentheses indicates the total number of traps in the county. Map by Anthony Zukoff, K-State Research and Extension.**

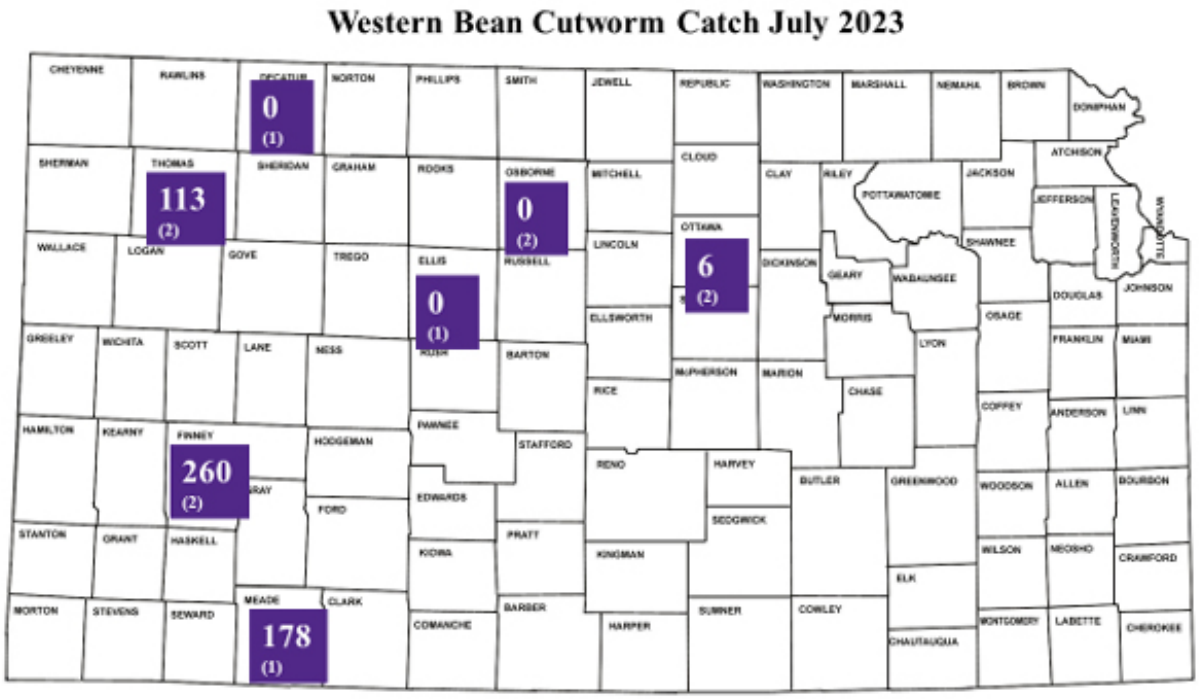


**Figure 4. Total western bean cutworm moth captures in July. The number in parentheses indicates the total number of traps in the county. Map by Anthony Zukoff, K-State Research**

**and Extension.**

In northwest Kansas, western bean cutworms were not detected until the second week of July and trap numbers were very low initially. In Thomas County, the flight has picked up significantly going into the last week of July with 108 of the total moths captured over the last 7 days (Figure 4). Scouting at-risk corn for egg masses is advised in the northwest region.

Control options and additional information on western bean cutworms can be found in the 2023 Corn Insect Pest Management Guide: https://www.bookstore.ksre.ksu.edu/pubs/MF810.pdf.

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## 6. Have problems with Sudden Death Syndrome in soybeans?

We are in search of grower fields with symptomatic Sudden Death Syndrome (SDS) plants for us to sample.

**What is Sudden Death Syndrome (SDS)?**

It is a soil-borne fungal disease caused by *Fusarium virguliforme*. Infection and colonization begin shortly after planting and the pathogen produces a toxin that causes above-ground symptoms later in the season.

**What are the symptoms?**

Root symptoms include necrosis and above-ground symptoms include interveinal leaf chlorosis and necrosis (Figure 1). Under the right environmental conditions, these symptoms appear as early as the start of flowering.

**Figure 1. Sudden Death Syndrome foliar symptoms in soybeans. Photo from Plant Pathology, K-State Research and Extension.**

**What are the environmental conditions?**

SDS is observed more when planted in cool, wet soils followed by wet conditions at the beginning of flowering.

**What are the management options?**

Seed treatment, resistant cultivars, planting date, tillage, and crop rotation.

If you are willing to participate or can recommend someone, please contact us:

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## 7. North Central Kansas Experiment Field Day, August 17

All interested individuals are encouraged to attend the North Central Kansas Experiment Field Fall Field Day at 1300 60 RD, Courtland, KS 66939 (2 miles north of HWY 36 on 60 RD). The event is scheduled for August 17 at 5:30 p.m. and is free to attend. A free meal will be provided at the conclusion of the program.

Topics and Speakers:

- Fungicides for corn and soybeans – Rodrigo Onofre
- Interaction of row spacing and herbicide programs – Sarah Lancaster
- Corn planting dates and maturity groups – Lucas Haag

# Kansas State University
# North Central Kansas Experiment Field
# Fall Field Day

**Thursday, August 17, 2023 at 5:30 PM**

**Location:**
1300 60 RD, Courtland, KS 66939
-OR-
2 miles N of HWY 36 on 60 RD

**Topics:**
Fungicides for Corn and Soybeans
*Rodrigo Onofre*

Interaction of Row Spacing and Herbicide Programs
*Sarah Lancaster*

Corn Planting Dates and Maturity Groups
*Lucas Haag*

**Dinner provided by FMC**

K-STATE
Research and Extension

Please contact Scott Dooley at 785-706-8450 or sjdooley@ksu.edu prior to this event if accommodations are needed for persons with disabilities or special requirements.
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