Issue 1066

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eUpdate

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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. Cereal rye control in wheat

Cereal rye can provide excellent weed suppression as a cover crop; however, it should be handled carefully. Cereal rye can be introduced into a wheat field (Figure 1) by contamination of harvest or seed conditioning equipment, dry fertilizer spreaders, or drills. Seeds and pollen can also be moved by wind or other natural means.

Cereal rye is very similar to wheat in terms of life cycle, growth requirements, and appearance. There are a few features that distinguish rye from wheat:

- **Plant height:** Cereal rye is generally taller than winter wheat.
- **Seed heads:** Rye seed heads are usually longer and thinner.
- **Ligule:** The ligule of cereal rye lacks the fringe of hairs that winter wheat has.
- **Auricles:** Cereal rye does not have prominent auricles, unlike winter wheat.
- **Seed characteristics:** Rye seeds are longer than wheat seeds and typically have a yellow or greenish shade, rather than red.

These differences can help with identifying cereal rye in the field.

Figure 1. Cereal rye growing in a wheat field. Photo by Sarah Lancaster, K-State Research and

Extension.

Chemical control of cereal rye in wheat is limited to herbicide-tolerant varieties (discussed later in this article). Because there are few herbicide options in crops, preventing the introduction of cereal rye into wheat fields is critical. Cleaning equipment and planting weed-free seed are two important measures. Hand rouging has long been used to remove cereal rye from wheat prior to harvest. Crop rotation is also important for controlling cereal rye and other winter annual grass weeds. Cereal rye emerging during a fallow phase of the rotation can be controlled with glyphosate. If cereal rye is present in wheat stubble, atrazine can be used if the following crop will be corn or sorghum.

Herbicide-tolerant wheat varieties

Clearfield wheat varieties allow the use of Beyond (imazamox). Imazamox is more effective on other cool-season grass weeds and only provides suppression of cereal rye. If you choose a Clearfield variety, be sure to spray before rye tillers and use a nitrogen fertilizer (up to 50% of the spray solution). Two applications (4 fl oz in the fall and 4 fl oz in the spring) will provide better control than a single application. If a single application is used, apply Beyond at the maximum single-use rate of 6 fl oz. However, it is important to note that imazamox resistance has been confirmed in cereal rye from Colorado.

CoAXium wheat varieties allow the use of Aggressor (quizalofop). Quizalofop provides excellent control of cereal rye. In studies at Great Bend, control was 94% or greater with 10 or 12 fl oz of Aggressor applied with either NIS or MSO in fall or spring. Quizalofop is a Group 1 herbicide that only controls grasses.

In both systems, cereal rye control will be reduced if applications are made when temperatures are below 40°F during the week following application.

For more detailed information, see the "2025 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide available online at https://www.bookstore.ksre.ksu.edu/pubs/CHEMWEEDGUIDE.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. Users should read and follow all label directions.

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2. Kansas Wheat Variety Guide 2025 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 2025 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 KS Mako, KS Bill Snyder, WB4422, and LCS Steel AX, along with the addition of ratings for several additional 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 2025* publication MF991 can be found here: https://www.bookstore.ksre.ksu.edu/pubs/MF991.pdf

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3. Strategic and occasional tillage as a management tactic in long-term no-tillage systems

The adoption of no-tillage (NT) farming increased water use efficiency and allowed for cropping intensification, especially in semi-arid environments like western Kansas, because of greater soil water storage with more crop residue kept on the soil surface. With more residue retained in NT systems, wind and water erosion are reduced, and more organic matter accumulates in the soil. However, despite these benefits, maintaining continuous NT has become increasingly challenging because of the lack of herbicide options for difficult-to-control and herbicide-resistant (HR) weeds, as well as issues with stratification of soil pH with increasing soil acidification near the surface.

The lack of effective herbicide options to control perennial grass weeds like tumble windmillgrass (*Chloris verticillata* Nutt.), tumblegrass (*Schedonnardus paniculatus*), and purple three-awn (*Aristida purpurea* Nutt.), as well as HR kochia (*Kochia scoparia* L.) and Palmer amaranth (*Amaranthus palmeri* S. Watson) pose some of the most significant challenges to long-term NT systems (Figure 1). With the increased costs of alternative herbicide options, increasing agricultural input costs, and reduced commodity prices, some farmers resort to tillage as a cost-effective strategy to manage weeds.

Figure 1. Purple three-awn, tumble grass, and tumble windmillgrass growing in a fallow field in Finney County. Note the nodding purple to red seed heads. Photo by Logan Simon, K-State Research & Extension.

K-State agronomists at the Western Kansas Research-Extension Centers in Hays, Garden City, and

Tribune have studied strategic and occasional tillage in NT fields to manage difficult-to-control and HR weeds and evaluated impacts on crop yields and soil properties.

What is strategic tillage?

Strategic tillage is defined as a one-time tillage operation in an otherwise NT cropping system to manage challenges of long-term NT (Figure 2), including difficult-to-control weeds and pH stratification. Following this strategic tillage operation, the system returns to NT. The sweep plow, a non-inversion conservation tillage implement, is the most commonly used implement for strategic tillage. Inversion-type tillage with a disk may be preferable in correcting pH stratification if needed.

Figure 2. No-till (left) and strategic tillage (right) following tillage and fertilizer applications in fallow in Ellis County. Photo by Augustine Obour, K-State Research & Extension.

What is occasional tillage?

Occasional tillage is defined as one or two tillage operations every three or more years to manage challenges of long-term NT, including difficult-to-control weeds as well as soil nutrient and pH stratification. This system of low-frequency tillage on a fixed schedule differs from strategic tillage, which is defined as a one-time tillage operation in an otherwise NT cropping system. By these definitions, occasional tillage may be considered a proactive approach while strategic tillage may be considered more reactive. The most commonly used implement for occasional tillage is the sweep plow, which is a non-inversion conservation tillage implement. Inversion-type tillage with a disk may be preferable in correcting soil nutrient and pH stratification.

Research overview

Overall, strategic and occasional tillage of long-term NT had no adverse effect on soil properties. Tillage effects on subsequent wheat yields were infrequent, but results at Garden City suggested that yields might be greater with one pass of tillage in fallow before wheat planting compared to NT. However, grain sorghum yields were occasionally reduced with one or two passes of tillage in wheat stubble at Hays and Tribune. Occasional tillage could be an effective tool for farmers to manage difficult-to-control and HR weeds. For more information on the results of these studies, please refer to the 2024 Agronomy eUpdate articles, "Strategic tillage in long-term no-tillage systems" and "Occasional tillage strategies in dryland cropping systems".

Best management practices when implementing strategic or occasional tillage

1. Strategic or occasional tillage with a sweep plow should be timed when soil erosion risk is lowest. In western Kansas, the best time is in the summer fallow period ahead of winter wheat.
2. Timing is critical to ensure successful control of perennial grass weeds. Tillage should be implemented with a sweep plow equipped with pickers, operated at shallow depth, on a hot, dry day with no chances for rain for several days following tillage.
3. The tillage depth should be kept shallow (1-2 inches) to control perennial grass weeds (most are shallow-rooted) and prevent the burying of crop residue. Deeper tillage may only spread and bury the weed rhizomes, increasing management challenges.
4. The frequency of strategic or occasional tillage will depend on the time it takes for issues to resurge after returning to NT management, though it may be six years or more between operations. More frequent tillage may negatively impact soil properties and crop yields.

For more detailed information on this study, please refer to:

- "**Assessing the Influence of Strategic Tillage on Crop Yields and Soil Properties in Dryland No-Tillage Systems**" in the 2023 Kansas Agricultural Experiment Station Research Reports: Vol. 9: Iss. 64. https://doi.org/10.4148/2378-5977.8487
- "**Occasional Tillage in a Wheat-Sorghum-Fallow Rotation**" in the 2025 Kansas Agricultural Experiment Station Research Reports: Vol. 11: Iss. 4. https://newprairiepress.org/kaesrr/vol11/iss4/9/

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4. Final irrigation of the growing season - Timing is everything

It has been a highly variable year across the state, with some irrigators being consistently ahead of crop needs thanks to timely rains, while other areas are in the middle of employing deficit irrigation strategies. As we look towards the end of the irrigation season, producers can improve their water productivity by properly timing their final irrigation application. An early termination of irrigation can result in reduced grain yield, mainly due to reductions in the kernel weight yield component. Conversely, a late termination of irrigation results in increased pumping and energy consumption, soil compaction risks at harvest due to increased soil water content, and the risk of soil profile water drainage over the winter

Understanding crop water use requirements late in the growing season ensures we match those needs without overirrigating. Table 1 shows anticipated water use for corn, grain sorghum, and soybeans growth stages to physiological maturity. This total water use can come from precipitation, irrigation, and stored soil water.

Table 1. Anticipated water use for corn, grain sorghum, soybeans, and dry beans at various growth stages.

Crop/Stage	Growth stage	Approximate days to maturity	Water use to maturity (inches)
Corn			
	Blister	45	10.5
R4	Dough	34	7.5
R4.7	Beginning dent	24	5
R5 Progression	½ Milk Line or Full dent	13	2.5
R6	Black layer	0	0
Grain sorghum			
GS6	Mid-bloom	34	9
GS7	Soft dough	23	5
GS8	Hard dough	12	2
GS9	Black layer	0	0
Soybeans			
R4	Full pod	37	9
R5	Beginning seed	29	6.5
R6	Full seed	17	3.5
R6.5	Yellowing Leaves	10	1.9
R7	Full maturity	0	0
Dry Beans			
R5	Early seed fill	35	7.0
R6	Mid-seed fill	25	4.2
R7	Beginning	15	2.0

	maturity		
R8	Harvest maturity	0	0

Corn, sorghum, and soybean data adapted from K-State MF2174, Rogers and Sothers. Dry beans data adapted from University of Nebraska-Lincoln, NebGuide G1871.

Research in western Kansas has shown the importance of keeping the management allowable depletion limited to 45% during the post-tassel period or maintaining available soil water contents above 55%. By knowing anticipated water use from a given growth stage and the remaining soil water in the profile, producers can apply just enough irrigation water to meet that demand and maintain profile available soil water content above 55% while adjusting for any precipitation that may be received.

Measurements of soil moisture at the end of the growing season are critical for meeting this target. Irrigators can use a soil probe to assess the appearance and feel of the soil to estimate soil water (L795 Soil Water Measurements: An Aid to Irrigation Water Management. Irrigation Management Series) or one of the soil water sensors on the market (Tips on Selecting a Soil Water Sensor - KSRE Bookstore).

By closely following the crop growth and development, one can know when physiological maturity, i.e., the black layer in corn or sorghum, has been reached. At that point, water use for the production of grain yield has ceased, and additional irrigation is unnecessary.

Termination based on calendar dates

Traditionally, many producers have used a fixed calendar date to determine their final irrigation. Long-term studies conducted by Freddie Lamm at the Northwest Research-Extension Center at Colby show the potential problems in this approach. Table 2 shows silking, maturity, and irrigation termination dates for a long-term study in corn. For this study, the irrigation termination date for maximum grain yield varied from August 12 to September 21. This is a significant departure from the general rule of thumb using Labor Day as a termination date. As shown, using a fixed date on the calendar without regard to crop progress, soil water status, or ET demand would have resulted in both forfeited yield and wasteful pumping across this timeframe.

Table 2. Silking, maturity, and irrigation termination dates for a long-term study in corn.

Year	Date of Anthesis	Date of Maturity	Irrigation Season Termination Date For		
			80% Max Yield	90% Max Yield	MaxYield
1993	20-Jul	30-Sep	5-Aug	5-Aug	15-Aug
1994	20-Jul	15-Sep	5-Aug	15-Aug	15-Aug
1995	20-Jul	29-Sep	5-Aug	13-Aug	18-Aug
1996	20-Jul	3-Oct	17-Jul	17-Jul	29-Aug
1997	23-Jul	1-Oct	23-Jul	23-Jul	27-Aug
1998	20-Jul	28-Sep	20-Jul	20-Jul	24-Aug
1999	23-Jul	6-Oct	24-Jul	13-Aug	20-Sep
2000	12-Jul	20-Sep	14-Sep	20-Sep	20-Sep
2001	16-Jul	29-Sep	30-Jul	22-Sep	22-Sep
2002	22-Jul	30-Sep	4-Aug	30-Aug	7-Sep
2003	22-Jul	23-Sep	3-Aug	3-Aug	18-Aug
2004	19-Jul	28-Sep	8-Aug	21-Aug	27-Aug
2005	20-Jul	28-Sep	2-Aug	9-Aug	29-Aug
2006	17-Jul	25-Sep	30-Jul	13-Aug	13-Aug
2007	18-Jul	19-Sep	14-Aug	21-Aug	28-Aug
2008	24-Jul	10-Oct	31-Jul	6-Aug	27-Aug
Average	**19-Jul**	**27-Sep**	**2-Aug**	**13-Aug**	**28-Aug**
Standard Dev.	**3 days**	**6 days**	**13 days**	**19 days**	**13 days**
Earliest	**12-Jul**	**14-Sep**	**17-Jul**	**17-Jul**	**12-Aug**
Latest	**24-Jul**	**10-Oct**	**14-Sep**	**21-Sep**	**21-Sep**

* *Estimated dates are based on the individual irrigation treatment dates from each of the different studies when the specified percentage of yield was exceeded.*

Consequences of excess late-season irrigation

In the silt-loam soils common in western Kansas, water drainage out of the soil profile starts to occur when the profile water content rises above 60% available soil water. The rate of drainage loss increases rapidly with increasing water content. Late-season irrigation in excess of crop water use results in increased accumulation of water in the profile, which is subject to drainage losses. A survey of irrigated corn fields was conducted in 2010 and 2011 (Figure 1). Fields were surveyed after corn harvest across three east-west transects in western Kansas.

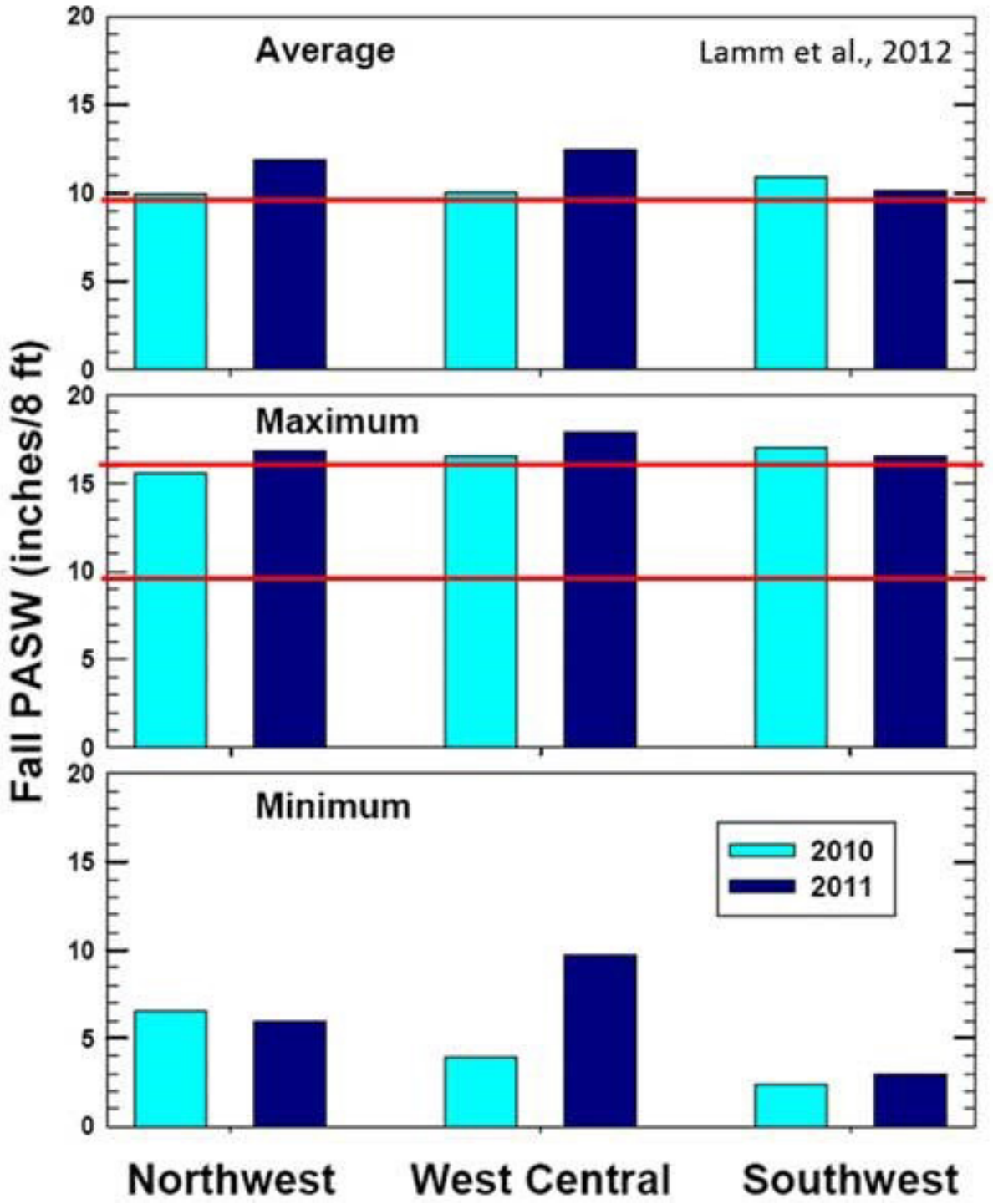

Figure 1. Results from a 2-year survey of irrigated corn fields. Fields were surveyed after harvest across three east-west transects in western KS.

The line at 9.6 inches of plant-available soil water (PASW) denotes the approximate water content where drainage losses would start to occur. On average, most producer fields were near this level of soil water storage, indicating a good management strategy as drainage losses had been minimized while yet maintaining adequate soil water to complete grain fill.

Producer fields near the minimum observed values likely did not have adequate soil water to ensure maximum grain yields. The most concerning scenario, however, is the fields at the upper end of soil water values, such as the maximum observation. The red line at 16 inches PASW represents field capacity, the point at which free drainage and significant water losses from the profile would occur. In the wettest producer fields, in all three regions, significant amounts of free drainage and water loss would have been occurring at the time of crop maturation and harvest.

Timing of the final irrigation:

1. Determine crop growth stage and anticipated remaining water use
2. Determine soil water status in the field by probe or calibrated soil sensor technology
3. Determine the irrigation strategy necessary to meet remaining crop water use while maintaining soil water content at or above 55% (limit depletion to 45%).
4. Be ready to make adjustments based on changes in ET demand, precipitation, etc.

Additional information, including a step-by-step procedure, can be found in the publication MF2174: "Predicting the final irrigation for corn, grain sorghum, and soybeans" - http://www.bookstore.ksre.ksu.edu/pubs/MF2174.pdf

Special Note: Much of the data in this article was collected by Freddie Lamm, Irrigation Engineer at the Northwest Research-Extension Center at Colby. Freddie passed away in May 2022, just months short of completing his 43rd year of irrigation research at the NWREC. A tribute to Freddie's career can be found at: https://newprairiepress.org/cgi/viewcontent.cgi?article=8336&context=kaesrr

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5. Strong winter canola yields were observed in Kansas in 2025

Winter canola yields were above average at most testing sites in Kansas in 2025. The primary reasons for the high yields were ideal flowering and grain filling temperatures and timely rainfall during April and May. Dense canopies filled with an abundance of seed pods were witnessed at the highest-yielding sites. The high yields are a positive outcome as more producers gain interest in growing winter canola to help meet the demands for oil.

Growing season summary

Canola trials were seeded in fall 2024 into marginal soil moisture conditions. Timely rainfall in October allowed the plants to establish well, setting the crop up with adequate top growth going into the winter months. Overall, winter temperatures were mild with occasional cold snaps, and snow cover was present at times to protect against the coldest temperatures. Little to no winterkill was observed. February and March were characterized by very dry conditions, and drought stress became visible as the crop was beginning to regrow. However, timely rains arrived in April and May, and cooler-than-normal temperatures carried into the reproductive and grain filling stages.

Yield Results

National Winter Canola Variety Trial (NWCVT) sites managed by the canola breeding program were harvested at Belleville, Garden City, Hutchinson, and Manhattan. Each NWCVT was split into two randomized trials, one with open-pollinated (OP) varieties and the other with hybrid varieties.

Belleville: Yields averaged 3,079 lb/acre for OP varieties and 3,390 lb/acre for hybrids. For only the second time in its history, the canola program harvested entries yielding over 5,000 lb/acre (100 bu/acre) at this site.

Garden City: OP and hybrid trial yields averaged 721 and 1,067 lb/acre, respectively. Yields were lower here due to stresses during reproductive stages, which reduced the number of pods in the crop canopy.

Hutchinson: OP and hybrid trials averaged 2,261 and 2,855 lb/acre, respectively. Hybrids outyielded OP entries by nearly 600 lb/acre, providing evidence that strong hybrid vigor exists as new materials are tested each year.

Manhattan: OP and hybrid trial yields averaged 2,101 and 2,258 lb/acre, respectively. The site experienced excessive fall growth, which elevated some plant crowns. In general, the hybrids were more prone than the OPs to the crown elevation, thus their yields were lower than expected.

Table 1 provides information on dates, precipitation (July 1, 2024 – Jun 30, 2025), and irrigation if available. NWCVT yields for Belleville and Manhattan (northern Kansas) are summarized for the OP and hybrid entries in Figures 1 and 2, respectively. Yields for Hutchinson (central Kansas) are summarized for the OP and hybrid entries in Figures 3 and 4, respectively. Yields for Garden City (southwest Kansas) are summarized for the OP and hybrid entries in Figures 5 and 6, respectively.

A reminder that if two varieties do not differ by more than the LSD, then little confidence can be placed in one being superior to the other. LSDs are provided where significant differences between

varieties were calculated.

Table 1. Location information for the 2025 winter canola growing season.

Location	Planting Date	Swathing Date	Harvest Date	Precipitation	Irrigation
Belleville	9/6/2024	6/25/2025	7/3/2025	25.21″	N/A
Manhattan	9/13/2024	6/10/2025	6/20/2025	31.02″	N/A
Hutchinson	9/27/2024	6/9/2025	6/16/2025	31.01″	N/A
Garden City	9/11/2024	N/A	6/27 & 7/1/25	21.64″	3.50″

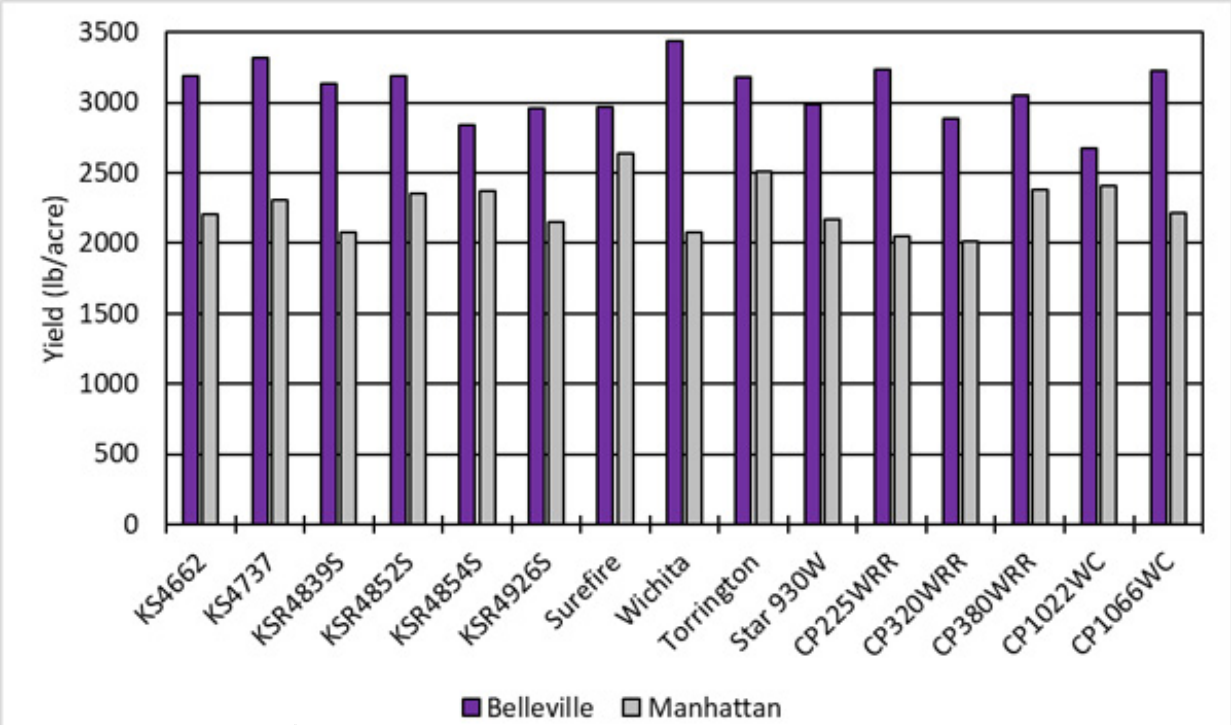

Figure 1. Yield results for northern Kansas (Belleville, Manhattan) OP variety trials. Manhattan LSD (0.05) = 319 lb/acre.

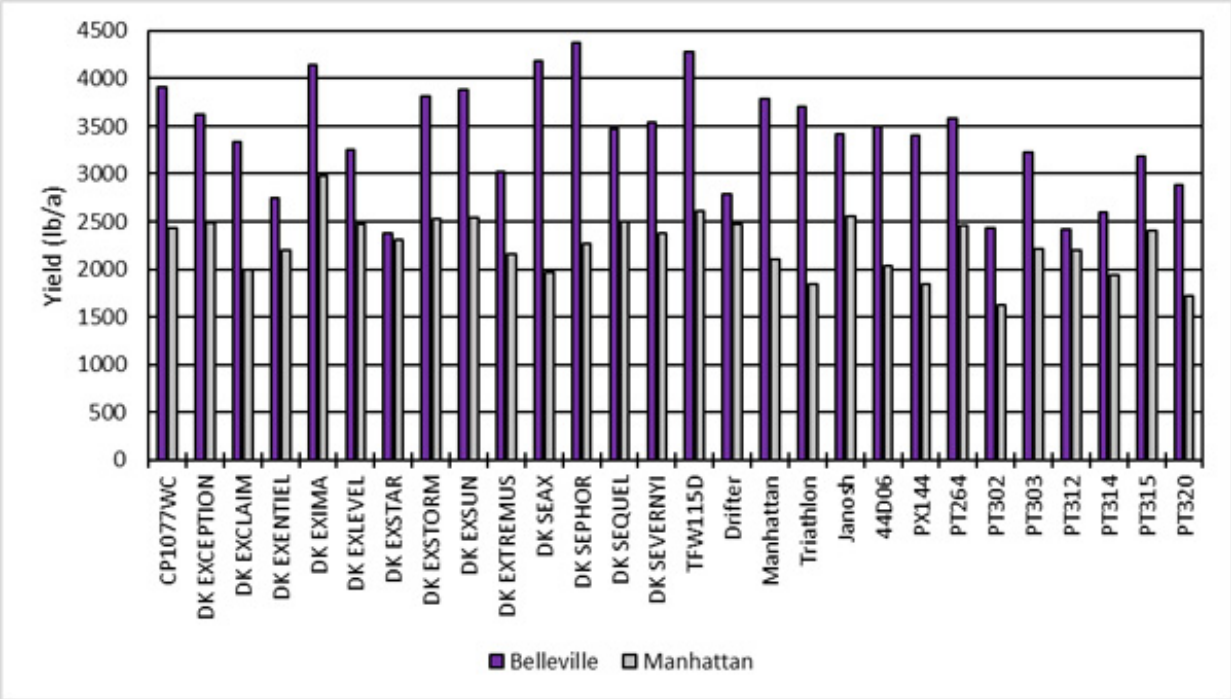

Figure 2. Yield results for northern Kansas (Belleville, Manhattan) hybrid variety trials. Belleville LSD (0.05) = 921 lb/acre; Manhattan LSD (0.05) = 611 lb/acre.

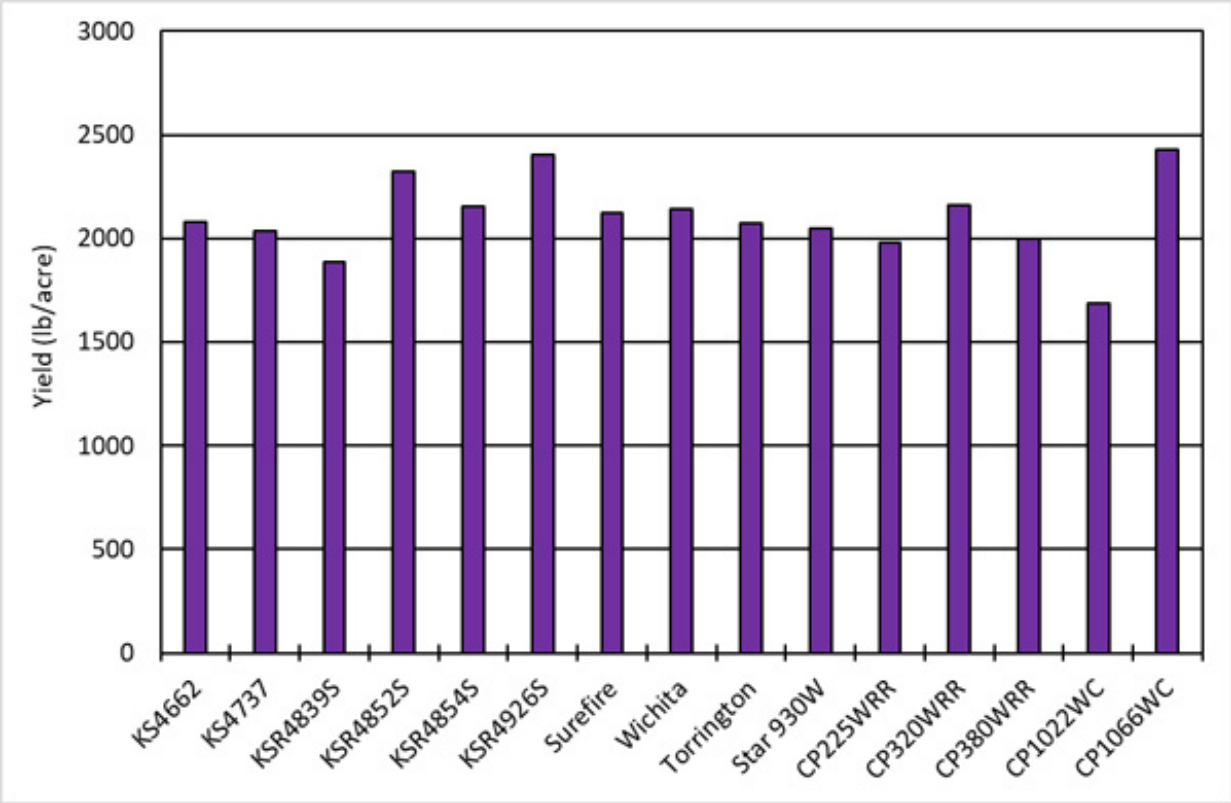

Figure 3. Yield results for central Kansas (Hutchinson) OP variety trial.

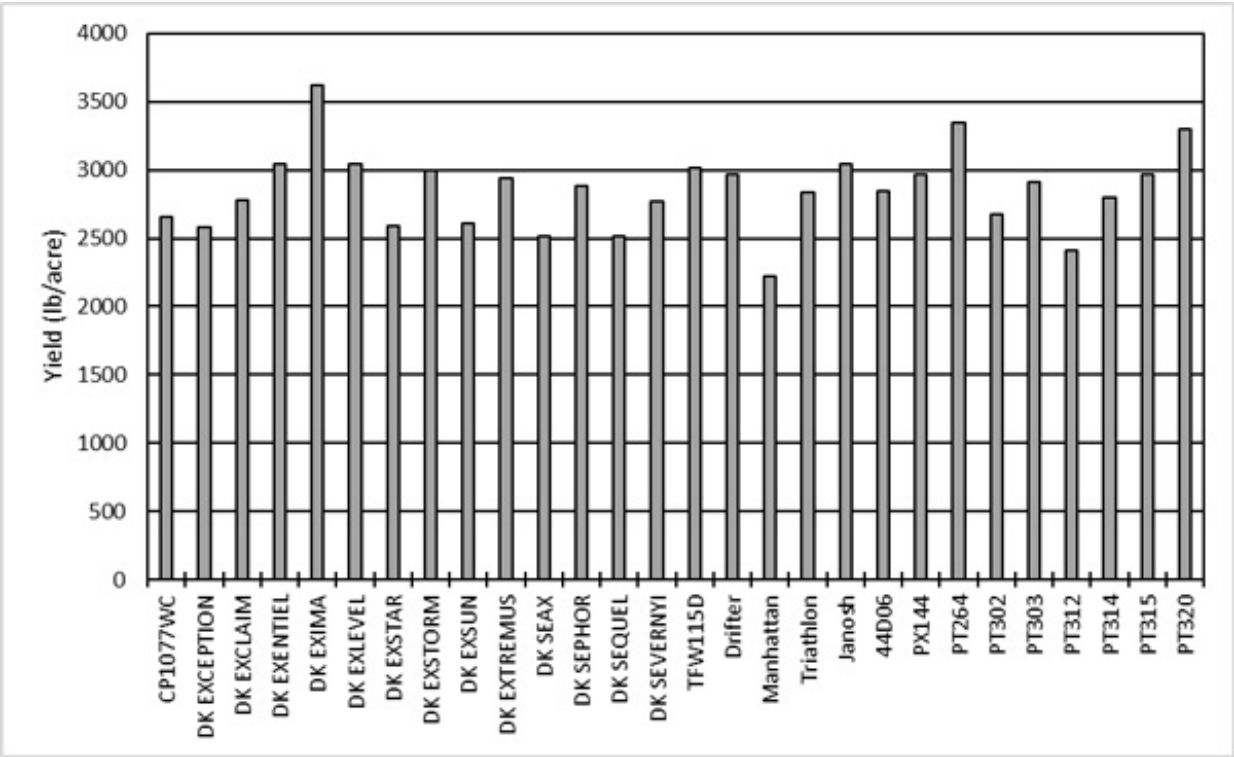

Figure 4. Yield results for central Kansas (Hutchinson) hybrid variety trial. LSD (0.05) = 631 lb/acre.

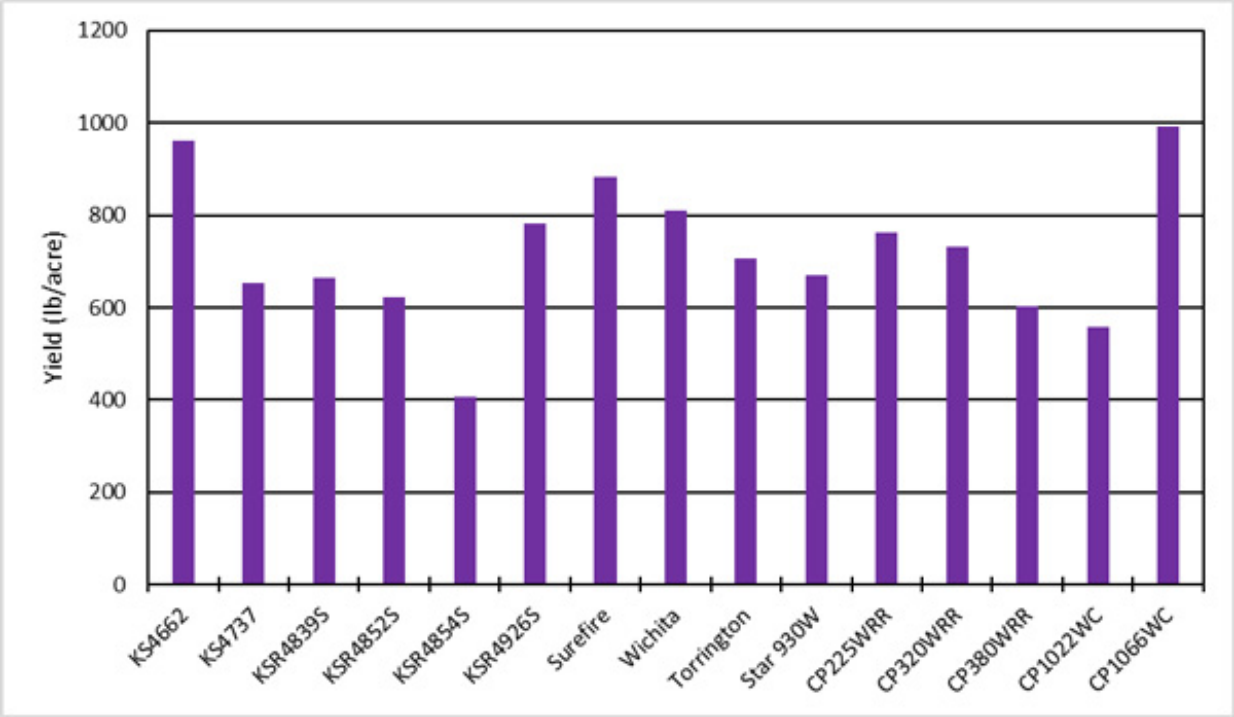

Figure 5. Yield results for southwest Kansas (Garden City) OP variety trial. LSD (0.05) = 288 lb/acre.

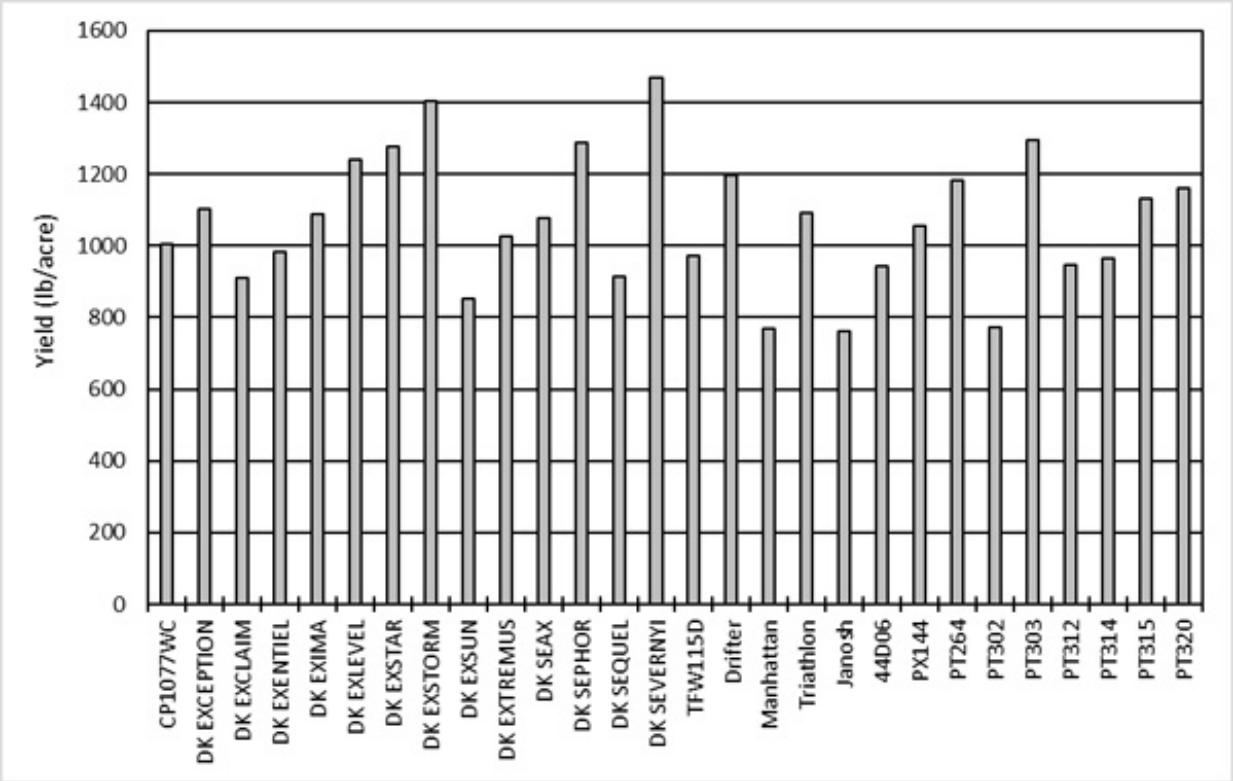

Figure 6. Yield results for southwest Kansas (Garden City) hybrid variety trial. LSD (0.05) = 353 lb/acre.

Careful variety selection is very important for successful winter canola production. Watch future Agronomy eUpdates for a discussion to help with variety selection and planting practices.

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6. Different types of drones used in precision agriculture

Drones are one of the most important precision agriculture tools. With the advancement in drone technology, they are digitizing the agriculture field by enabling data-driven decision-making to increase crop and ranch production, sustainability, and efficiency. Not only do drones provide a bird's-eye view of our soil, crops, and ranch, but they are also now used in diverse applications such as agricultural operational activities like spraying and seeding. Based on their structure, performance, and roles, agricultural drones can be categorized into different types. There are different types of drones commonly used in precision agriculture.

Multirotor drones

Multirotor drones usually have four to six rotors (Figure 1). These drones are quite popular in agriculture for mapping and spraying purposes. They have hovering capacity, which enables them to hover over a specific area to get detailed information or spray. As these drones usually fly at lower altitudes compared to fixed wings, the images are of higher resolution. Since these drones can take off and land vertically, they might not need too much space for operation. These drones are quite excellent for a small area. However, the battery life of a multirotor drone is about 20 to 45 minutes, making them less practical for larger fields. In addition, they are less stable than a fixed-wing drone in wind conditions.

Modern multirotor drones come with different advanced features such as anti-collision, obstacle detection/ avoidance, Real Time Kinematic (RTK), Post-Processed Kinematic (PPK), and Global Navigation Satellite System (GNSS) features. Based on needs, different sensors such as RGB, multispectral, LiDAR, thermal, and hyperspectral sensors can be mounted on these drones for different purposes.

Figure 1. A multirotor type of drone is collecting imagery over a corn field. Photo by Deepak Joshi, K-State Research and Extension.

Fixed-wing drones

Fixed-wing drones usually have wings, and they look like a small airplane (Figure 2). Usually, these types of drones have greater coverage and better battery life for long flight times. These can be used to survey or map a quarter section (160 acres) of field within 45 minutes or less, depending on wind speed. Moreover, due to better aerodynamic design, these drones can also handle windy conditions better than other types of drones. Fixed-wing drones with multispectral sensors are commonly used for scouting, surveying, field mapping, crop health monitoring, and Irrigation monitoring. The main limitations of these types of drones may be the need for open space for taking off and landing, as these drones usually cannot take off and land vertically. Moreover, these drones also lack hovering capabilities, which will not allow them to hover over a specific part of the field or ranch.

In terms of cost, usually fixed-wing drones are slightly more expensive compared to some other types of drones, but still, the total cost will be different based on the different features present. Many modern fixed-wing drones have different advanced features, such as automated flight planning, which allows automated flight and pre-programmed missions without minimal manual intervention. Some other safety features might be geofencing, which can define no-fly zones by creating boundaries around the field, as well as altitude limits to prevent drones from entering restricted airspace and reduce the chances of losing drones. In addition to that, Real Time Kinematic (RTK) and Post-Processed Kinematic (PPK) and Global Navigation Satellite System (GNSS) features in drones also ensure high-accuracy geolocation, ensuring flight stability through precise positioning.

Figure 2. A fixed-wing imaging drone. Photo by Deepak Joshi, K-State Research and Extension.

Hybrid drones

Hybrid drones have the features of both fixed-wing and multirotor drones. Due to these combined features, these drones can perform more efficiently as well as precisely. These drones are ideal for mid to large-sized fields. However, compared to other drones, they are comparatively less common in the agricultural field.

Operational drones

These drones are more specialized for agricultural operational activities such as spraying pesticides, herbicides, or seeding. These drones can be found in both fixed-wing (Figure 3a) and multirotor types (Figure 3b). Usually, fixed-wing operational drones have larger coverage areas and longer battery life. Multirotor operational drones can hover over specific areas of crops and ranches to spray and seed more precisely. Spot treatment for weeds or diseases is possible using spray drones.

These operational drones have multiple benefits due to precision application, less or minimal drift, they can reach difficult-to-reach areas or wet soil condition areas, and are also considered time and cost saving compared to other spraying methods. However, the overall effectiveness of the spray with these drones depends on various factors, including flight altitude, flight speed, wind speed/direction, temperature, nozzle types, droplet size, spray liquid properties, etc. Moreover, limited battery life and payload capacity might limit their operation for larger fields.

Figure 3a. Fixed-wing spraying drone. Photo by Deepak Joshi, K-State Research and Extension.

Figure 3b. Multi-rotor spraying drone. Photo by Deepak Joshi, K-State Research and Extension.

Conclusion

Drones are now transforming the agriculture sector and are used for various purposes, including field scouting, mapping, surveying, and operational activities. These drones are of different types, and each has its own strengths and weaknesses. By understanding these different types of drones, growers and agronomists can best determine which drone meets their needs. Regardless of the type of drone, it is important to follow all Federal Aviation Administration (FAA) rules and regulations to

ensure safe and legal drone operations.

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7. World of Weeds: Ground cherry species

This World of Weeds article features groundcherry species (*Physalis* species). We're noticing these weeds more frequently in pastures, hay fields, and rights of way. There are several groundcherry species with very similar characteristics. You're most likely to encounter longleaf groundcherry (*P. longifolia*) in western KS or smooth groundcherry (*P. longifolia var subglabrata*) in eastern KS. Other perennial groundcherry species that occur in Kansas include clammy groundcherry, hispid groundcherry, prairie groundcherry, and Virginia groundcherry. Groundcherry species are in the Solanaceae family, like tomatoes, peppers, and potatoes, and in the same genus as tomatillos, a common ingredient in Mexican dishes. The genus name Physalis refers to the balloon-like husk (calyx) around the fruits.

Ecology

Longleaf and smooth groundcherry are native perennial plants that can reproduce from seed or spread by rhizomes. They prefer sunny locations and moist, well-drained soils.

Identification

Groundcherry identification is challenging due to subtle variability within and between the species.

Longleaf and smooth groundcherry are typically 15 to 30 inches tall, but can grow up to 3.5 feet. Stems are angular (not quite square), light green or purplish-green, and are usually smooth but may have a few short hairs, especially on younger plants (Figure 1). Older stems may become woody. Numerous branches give smooth ground cherry a bushy appearance. Some of the lower branches may grow along the ground.

Figure 1. Smooth groundcherry growth habit. Note the angular stem and alternate leaves with wavy margins. Photo by Sarah Lancaster, K-State Research and Extension.

Leaves are about 1 to 6 inches long and 0.25 to 3 inches wide. They are alternately arranged along the length of the stems by petioles 0.25 to 0.75 inches long. As the names imply, longleaf groundcherry has elliptic to lance-shaped leaves with entire margins, while smooth groundcherry leaves are oval to egg-shaped with wavy margins (Figure 1). Leaves have rounded bases, usually with one-half of the base lower than the other. Both the upper and lower leaf surfaces are hairless, except for short hairs along the underside of major veins.

Single, bell-shaped flowers hang from pedicles about 0.75 to 1 inch long below the leaf and the axils in the upper portion of the plant. Yellow flowers about ¾" across have 5 lobes with a slight point at the tip of each lobe and purplish-brown patches at the center (Figure 2).

Figure 2. Smooth groundcherry flower. Note the purple star in the center. Photo by Sarah Lancaster, K-State Research and Extension.

Smooth ground cherry is an indeterminate plant with flowers and fruits occurring on a single plant at the same time. Fruits are spherical, about 0.5 inch in diameter, and surrounded by a papery, ridged husk (Figure 3). Mature berries are smooth and yellow and contain many seeds in a fleshy interior. Pale yellow seeds are flattened, kidney-shaped, and about less than 1/16-inch wide.

Figure 3. Smooth groundcherry fruit. Note the ridges. Photo by Sarah Lancaster, K-State Research and Extension.

Management

Because of the rhizomes, tillage should be repeated to avoid reestablishment, especially in moist environments where disturbed plants are likely to root.

There is little current research regarding chemical control of perennial groundcherry species. Historical recommendations suggest that herbicides that contain the active ingredients glyphosate (RoundUp, others) or 2,4-D will provide good control. Our observations suggest that glufosinate-containing herbicides (Liberty Ultra, others) will kill top-growth. No products include perennial groundcherry species on the label; however, several list cutleaf groundcherry, and annual species, and may be useful to manage perennial groundcherry species. These herbicides include: atrazine (Aatrex, others), carfentrazone (Aim, others), sulfentrazone (Spartan, others), fomesafen (Reflex, others), and saflufenacil (Sharpen, others).

For more information, see the "2025 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide available online at https://bookstore.ksre.ksu.edu/pubs/SRP1190.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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8. Western Kansas Fall Field Day Plus - Garden City, August 21

In southwest Kansas, where every inch of water and acre of land must work harder than ever, the Southwest Research-Extension Center (SWREC) has long stood as a hub for innovation and discovery. From managing herbicide-resistant weeds to finding practical solutions for aquifer decline, the center's research plays a vital role in helping producers adapt to a changing landscape.

That work will be on full display during the 2025 Field Day Plus, hosted at SWREC at 4500 E. Mary St in Garden City on Thursday, Aug. 21, beginning at 8 a.m. The event includes morning research plot tours, industry booths, a sponsored lunch, and a special groundwater panel discussion in the afternoon focused on Ogallala aquifer sustainability and farm management strategies.

The event begins with registration and displays, followed by two concurrent 75-minute field tours. The South Field tour will showcase:

- **Weed Management in Corn and Grain Sorghum** – led by Pat Geier, focused on tackling herbicide-resistant Palmer amaranth.
- **Long-term Reduced and No-till Wheat-Sorghum-Fallow Systems** – presented by John Holman, K-State cropping systems agronomist, sharing yield data and sustainability insights from years of side-by-side comparisons.
- **Warm Season Hay and Silage Trial** – also by Holman, highlighting forage options that offer resilience and flexibility in dryland rotations.

Meanwhile, the Finnup Field tour will feature:

- **Cotton Growth and Development under Different Management Strategies** – with Logan Simon, K-State southwest area agronomist.
- **Recharging the Aquifer with KSU-TAPS** – led by Renee Tuttle, K-State TAPS associate director, featuring the 2025 TAPS Farm Management Competition and sustainable irrigation technology.

At 12:15 p.m., attendees will gather for lunch and a **groundwater producer panel** that brings together farmers, researchers, and local leaders to talk candidly about the future of water in the region. Panelists include Matt Long (Leoti), Tom Lahey (Moscow), Walt Beesley (Hugoton), and Jon Handy (Kismet), each bringing unique perspectives and on-farm experience to the discussion. The panel will address declining aquifer levels, conservation tools, and economic decision-making under limited irrigation.

To learn more and RSVP, visit https://www.wkrec.org/events/.

Lunch will be provided thanks to event sponsors American Implement, BASF, LDI Inc., and Dragon-Line.

2025 K-State SWREC Fall Field Day Plus

AUGUST 21, 2025 - 8:00 AM
SW Research-Extension Center
4500 E. Mary Street
Garden City, KS 67846-9132

SCHEDULE

8:00 am - Registration
9:00 am - Welcome and Introductions
followed by Field Tours

- Weed Management in Corn and Grain Sorghum
- Long-term Reduced and Notill Wheat-Sorghum Fallow
- Warm Season Hay and Silage Trial
- Management Effects on Cotton Growth and Development
- Recharging the Aquifer with KSU-TAPS - 2025 Farm Management Competition & Sustainable Irrigation Tactics

12:15 pm - Lunch
1:00 pm - Indoor presentations

- 2025 Corn Leaf Hopper Update
- Cultivating Resiliency

2:00 pm - Groundwater Management District Grower Panel Discussion

RSVP REQUESTED BUT NOT REQUIRED
SCAN HERE

JOIN US FOR THE FIELD DAY — AND SO MUCH MORE

In addition to field tours and research highlights, explore industry booths, get the latest farm financial updates, connect with community wellness resources, and enter for a chance to win great door prizes.

THANK YOU TO OUR SPONSORS

American Implement, BASF, LDI Inc., Pioneer Hibred and Dragon-Line

FOR MORE INFORMATION

E wkrec@ksu.edu
W www.wkrec.org/events

Kansas State University is committed to making its services, activities and programs accessible to all participants. If you have special requirements due to a physical, vision, or hearing disability, contact Kelsey Stremel, WKREC. Kansas State University Agricultural Experiment Station and Cooperative Extension Service K-State Research and Extension is an equal opportunity provider and employer

K-STATE Research and Extension | Southwest Research - Extension Center

9. Western Kansas Fall Field Day - Hays, August 26

Whether it's breeding new drought-tolerant crops, innovating systemic weed control strategies, or exploring better ways to integrate forages and livestock, the research at Kansas State University's Agricultural Research Center–Hays is grounded in the needs of farmers and ranchers in western Kansas.

That boots-on-the-ground focus will be front and center at the 2025 Fall Field Day on Tuesday, Aug. 26, beginning at 9 a.m. The event will feature a morning session of field plot tours and technology demonstrations, followed by lunch and a series of short indoor presentations. You can register for the field day and learn more at www.wkrec.org.

Morning tour stops will include demonstrations of See-and-Spray precision technology for targeted herbicide application, as well as a harvest weed seed destructor, a newer tool in integrated weed management being evaluated for Palmer amaranth control in western Kansas. Other stops will highlight nitrogen fertility management in sorghum, annual forage rotations, and integrated livestock and crop systems, with practical insights for producers managing wheat-sorghum-fallow rotations or seeking to improve grazing resources.

The tour will also feature K-State's expanding pearl millet breeding program, which includes more than 200 experimental hybrids under evaluation. Researchers at Hays are working to position this climate-resilient, drought-tolerant cereal as a promising grain and forage option for dryland production in the central Great Plains.

Following the morning tours, guests are invited to a complimentary lunch and an indoor poster session featuring current research from graduate students and faculty. Afternoon presentations will cover topics such as cover crop adoption, herbicide efficacy, tillage effects on soil health, and drought-tolerant crop development.

The Agricultural Research Center is located at 1232 240th Ave., Hays, Kan. No RSVP is required, and lunch is provided.

For more information, contact wkrec@k-state.edu or visit www.wkrec.org

2025 K-State ARCH Fall Field Day

AUGUST 26, 2025 - 9:00 AM
Agricultural Research Center
1232 240th Ave Hays, KS 67601

RESEARCH IN ACTION

Join us at the K-State ARCH Field Day to see practical, research-driven solutions for crops, forages, and livestock in western Kansas. Tour the plots, hear from experts, and enjoy a free lunch and indoor sessions.

- Integrated weed management strategies for Palmer amaranth control in imazamox-resistant grain sorghum - Jeremie Kouame
- Harvest weed seed destructor as an additional tool in the integrated weed management toolbox - Jeremie Kouame
- Demonstration of See- and Spray technology for weed control- Carrico Implements & Jeremie Kouame
- Integrating annual forage and livestock in wheat-sorghum-fallow systems-Augustine Obour & Zach Carson
- Nitrogen fertility management in grain sorghum–Augustine Obour
- Warm season annual forage variety trial and insurance management-Logan Simon
- Effects of supplementing beef calves with distillers grain on the ground on the control of an invasive grass species
- Pearl millet: A climate resilient new grain and forage species- Ram Perumal

RSVP REQUESTED BUT NOT REQUIRED
SCAN HERE

SCHEDULE

9:00 am - Registration
9:15 am - Welcome and Introductions followed by Field Tours
12:25 pm - Lunch
1:00 pm - Indoor presentations
- WKREC Department Update
- 2025 Corn Leaf Hopper Update
- Student Research Poster Session

FOR MORE INFORMATION

wkrec@ksu.edu
www.wkrec.org/events

Kansas State University is committed to making its services, activities and programs accessible to all participants. If you have special requirements due to a physical, vision, or hearing disability, contact Kelsey Stremel, WKREC. Kansas State University Agricultural Experiment Station and Cooperative Extension Service K-State Research and Extension is an equal opportunity provider and employer

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10. Upcoming pre-plant wheat schools across Kansas

K-State Research and Extension will host several pre-plant wheat schools in August, offering producers timely updates on variety selection, disease management, and production practices ahead of the 2025 planting season. Each program features presentations from K-State specialists and provides an opportunity for Q&A. Meals are included at all locations with advance registration.

There may be additional schools near you. Check with your local KSRE extension office for information.

Pre-Plant Wheat School – Great Bend
Date/Time: Wednesday, August 20 – Registration & dinner at 5:30 p.m.
Location: Great Bend Event Center, 3111 10th Street, Great Bend
Topics: Wheat diseases and wheat varieties
RSVP: By August 15 to 785-628-9430, tam3@ksu.edu, or bit.ly/cottonwood-wheatschools
Dinner is provided with registration.

Pre-Plant Wheat School – McPherson
Date/Time: Monday, August 25 – Meal at 6:30 p.m., program at 7 p.m.
Location: First United Methodist Church, 1200 East Kansas Avenue, McPherson
Topics: Wheat varieties, wheat diseases, soil fertility, and weed management
RSVP: smarston@ksu.edu, tregehr@ksu.edu, or 620-241-1523
Special ladies' program, "Sow & Grow" with Laura Savage, includes a hands-on terrarium workshop. Pre-register by August 13; cost $10.

Pre-Plant Wheat School – Kingman
Date/Time: Wednesday, August 27 – 6 p.m.
Location: Kingman Expo Center (North Room), 121 S Main, Kingman
Topics: Best practices for volunteer wheat control, variety resistance and selection, wheat streak mosaic virus
RSVP: By August 26 to 620-532-5131 or gschnei@ksu.edu
Light meal and refreshments provided.

11. Pre-plant winter canola meeting - August 26

A winter canola pre-plant meeting will be held on Tuesday, August 26, 2025, at the Dillons Nature Center, 3002 E. 30th Ave., near Hutchinson, KS. The event will begin at 10:30 a.m., with a catered lunch provided following the meeting.

This informative session is designed for growers and anyone interested in winter canola production. Topics for the day include:

- A wrap-up of the 2025 winter canola season
- Variety trial results and guidance for selecting the best options for your operation
- Planting tips to optimize yield and crop performance
- Marketing insights

The meeting is proudly sponsored by K-State Research and Extension, the Great Plains Canola Association, and Scoular.

To attend, RSVP by contacting the Reno County Extension Office at 620-662-2371 or by email at pbergkamp@k-state.edu. Early registration is encouraged to help plan for lunch.

12. K-State Regenerative Agriculture Field Day - September 11

Farmers, researchers, and ag professionals are invited to attend the K-State Regenerative Agriculture Field Day on Thursday, September 11, 2025, from 8:30 a.m. to 2:15 p.m. at Knopf Farms, 6229 S Kipp Road, Gypsum, KS.

This year's theme is "All About Cover Crops!". The program will feature on-farm research results exploring how cover crops influence soil health, nutrient management, and pest management. A producer roundtable will highlight real-world opportunities and challenges of using cover crops. The day also includes a field visit after lunch.

Coffee, donuts, and a BBQ lunch will be provided. The event is free to attend, but registration is required at KSURA.short.gy/FieldDay.

K-State Regenerative Agriculture Field Day

Knopf Farms 8:30 AM – 2:15 PM
Thursday, September 11th, 2025
6229 S Kipp Road, Gypsum, KS

All About Cover Crops!

- On-farm research results on how cover crops affect soil health, nutrient management, and pest management
- Includes a producer roundtable discussing opportunities and challenges of using cover crops
- Coffee, donuts, and BBQ lunch provided
- Field visit after lunch
- Free to attend, but registration required

Register at KSURA.short.gy/FieldDay

Kansas State University Department of Agronomy
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13. Wheat Rx Preplant Seminar - August 20 in Pratt

All are invited to attend the Wheat Rx Preplant Seminar on Wednesday, August 20, 2025, in Pratt, Kansas. This educational event is hosted by K-State Research and Extension and Kansas Wheat and will cover critical topics to support wheat management decisions ahead of the 2025-26 planting season.

The seminar will feature expert presentations on:

- Wheat variety selection
- Wheat streak mosaic virus
- Conservation practices in wheat-based cropping systems
- Wheat management for high yield and profit

This seminar is part of the Wheat Rx initiative, an ongoing partnership between Kansas Wheat and K-State Research and Extension to promote the adoption of proven, research-based management strategies for producing high-quality, high-yielding winter wheat in Kansas. In this event, we will also highlight a new initiative to promote the adoption of conservation practices in wheat-based cropping systems across Kansas, which is funded by the National Fish and Wildlife Foundation. In addition to in-person seminars, the Wheat Rx effort includes a collection of Extension publications and resources available at kswheat.com/wheatrx.

Event Details

Date: August 20, 2025
Location: Pratt County 4-H Events Center
Address: 81 Lake Road, Pratt, KS
Registration: https://kswheat.com/prattrx

Tentative Program Schedule

Time	Topic	Speaker
8:00 AM	Registration	
8:15 – 8:45	Kansas Wheat Overview	Aaron Harries
8:45 – 9:30	Wheat Variety Selection	Allan Fritz
9:30 – 10:15	Wheat Streak Mosaic Virus	Kelsey Andersen Onofre
10:15 – 10:30	Break	
10:30 – 11:15	Conservation Practices in Wheat-Based Systems	Logan Simon
11:15 – Noon	Wheat Management for High Yield and Profit	Romulo Lollato
Noon	Lunch	

Registration

Members of the Kansas Association of Wheat Growers (KAWG) receive one free registration to this event. Non-member registration is $110. To take advantage of the member benefit, join or renew at

kswheat.com/join. The registration link for the event is https://kswheat.com/prattrx. Lunch will be provided for all attendees.

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