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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. Wheat leaf rust establishes a foothold in Kansas

Leaf rust is causing problems for some wheat producers in Kansas this fall with reports of wide spread infections in volunteer wheat and the early planted fields in western and central regions of the state. In some cases, the leaf rust is severe enough to cause significant discoloration of the young plants (Figure 1). The disease likely survived the summer months on volunteer wheat that is also prevalent this fall.

Figure 1. Wheat with severe leaf rust infection developing this fall (Photo by Jeanne Falk-Jones, K-State Research and Extension).

Many producers are asking if fungicide applications are needed control leaf rust infections yet this fall. When the wheat is intended for grain harvest, the answer to this question is often “No”. Fall fungicide applications are rarely needed to control leaf rust and preserve grain yield potential. In many years (60%), leaf rust does not survive the winter in Kansas and the disease must be reintroduced from areas in the southern U.S. or Mexico where the fungus is able to persist. However, growers should be monitoring their wheat for signs of rust throughout the winter. It is particularly important to check for signs of rust as the crop “greens-up” and begins to grow in March and February. During these months Leaf rust fungus must move from the overwintering leaves to the new growth. If the fungus fails to move, the local disease population will decline rapidly as the old leaves (the food source for the fungus) deteriorate and the plant redirects resources to the new growth.

If the fungus does survive locally, fungicide applications may be needed in the spring. Fields with overwintering leaf rust are candidates for fungicide application just prior to the jointing stages of growth. These treatments are most effective when combined with a second fungicide application between flag leaf emergence and heading. When diseases are not present or remain at low levels prior to jointing, a single fungicide application protecting the flag leaves is generally enough to maintain yield potential.

Some consultants recently suggested that the value of fall applied fungicides may be greater for wheat intended for grazing pasture than it is for grain only production systems. Their observations suggest that the amount and quality of forage is negatively influence by severe leaf rust infestations. The statements seem logical, as leaf rust damages the leaf tissue we would expect a reduction in total forage, protein content, and moisture. We would also anticipate an increase in fiber content if the forage as well. While these facts are supported by field observations, it should be noted that K-State does not have research data to address the role of fungicides in preserving forage yield and quality. Growers attempting protect forage yields of wheat should also carefully evaluate fungicide product labels for grazing restrictions. Some fungicide labels prohibit grazing for between 6-30 days after application (Table 1).

Table 1. Sample of fungicide label restrictions for grazing wheat or harvest for forage

Product (active ingredient)	**Grazing or Forage Restriction**
Folicur (tebuconazole)	Do not graze of feed green forage for 6 days after application
Prosaro (tebuconazole + prothioconazole)	Do not graze of feed green forage for 6 days after application
Tilt (propiconazole)	No harvest for forage or hay within 7 days after application
Qult Xcel (propiconazole and azoxystrobin)	No harvest for forage or hay within 7 days after application
Approach Prima (picoxystrobin and cyproconazole)	No harvest for forage or hay within 21 days of application
Absolute Maxx (tebuconazole and trifloxystrobin)	Do not graze or harvest for forage within 30 days of application

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2. Nitrogen loss potential from wheat fields this fall

Recent persistent rains and wet soils in some areas of Kansas can contribute to some level of N loss this fall. Will these conditions affect N availability and wheat growth? And if so, what is the need for an N fertilization adjustment?

Wheat growth and biomass accumulation is very limited in the fall, and therefore the N demand during this time of the year is no more than 20-40 lbs N /acre, with the majority of the N uptake occurring in the spring after green-up. A topdress N fertilization program with N applications in late winter/early spring helps synchronize the time of high demand with the availability of N in the soil. However, a fall pre-plant N fertilization program is also a good alternative for most soils in Kansas, considering that the months with the lowest precipitation in Kansas are typically during fall and winter, resulting in low risk for N loss.

It is important to keep in mind that N must be in the nitrate-N (NO_3^-) form to be susceptible to leaching or denitrification loses. Factors such as N fertilizer source and conditions for the nitrification process this fall should be considered, in addition to the amount of precipitation and the soil type.

Since nitrification is a biological process, how quickly ammonium-N (NH_4^+) in soil converts to nitrate-N is a function of soil oxygen content, soil temperature, pH, N application method, and perhaps most importantly, how long the N has been in the soil.

Nitrification is an aerobic process and requires high levels of soil oxygen. Conditions that reduce oxygen supplies, such as wet soils, will inhibit nitrification and keep N in the ammonium form. Optimum soil temperatures for nitrification are in the range of 75-85 degrees F. However, nitrification occurs any time the soil temperature is above freezing, just at a slower rate. As a result, the timing of N application is critical for estimating the amount of N that may be present as nitrate.

Fertilizer application method is also a key factor impacting nitrification rate. When urea or UAN are broadcast, nitrification will occur more rapidly than when those materials are subsurface banded. Broadcast fertilizer is in contact with more soil containing the bacteria responsible for nitrification, so the nitrification process occurs more rapidly. Also, some sources such as anhydrous ammonia require several months to convert all the ammonia to nitrate, reducing the risk of N loses.

In summary, for wheat fields already fertilized with the full rate of N this fall, the risk of N loss will be higher for sandy soils, and early N application using sources such as UAN (25% in the nitrate form), or broadcast urea. However, for medium-textured soils, N fertilizer source such as anhydrous ammonia (or with the use of nitrification inhibitors) the risk for any N loses is minimum. One option to help producers assess their situation is to create some “reference strips” in the field by adding some additional N. Adding 1 pound of urea to an area 10 feet wide by 25 feet long would be equivalent to adding around 80 pounds of additional N. Observing the differences between the “reference strip” and the balance of the field can provide a good idea of the degree of N loss.

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3. Sorghum midge: Implications for grain sorghum in central and western Kansas

The sorghum midge, *Contarinia sorghicola*, is a key pest of sorghum throughout tropical and sub-tropical regions of the world. This tiny reddish or orange fly can complete a generation in nine days, and adults only live for 24-48 hours. Eggs are laid at the base of florets at anthesis and larvae develop within the developing seed, resulting in empty or 'blasted' seed capsules (Figure 1).

Figure 1.Sorghum midge (left photo) and damaged seed capsules on sorghum head (right photo). Photo submitted by J.P. Michaud, K-State Research and Extension.

This is a tropical insect which does not diapause or overwinter in temperate regions such as Kansas. In fact, it is very rare to find any economic damage from midge this far north. In the past, there have been only anecdotal observations of midge activity in southwest Kansas and occasionally along the Oklahoma border. This year, damage appears to be very widespread through central and western Kansas (low grain yields and test weights) in areas which have never before experienced midge infestations. This is probably associated with the long 2018 summer season with lots of humidity in the crop due to copious rainfall amounts. So, 2018 may represent an anomaly, or it may bode a future in which midge infestations become more common in Kansas.

Control requires scouting fields at flowering by knocking heads into a white plastic bucket or cut out gallon milk jug and then looking for the small red flies in the container. Thresholds vary, but generally an average of one fly per head is enough to warrant treatment. Although these insects are easy to kill with contact insecticides, spraying such materials will risk causing resurgence of other pests currently under good biological control, including sugarcane aphid.

A new section on sorghum midge monitoring and management will be included in the 2019 revision of the K-State Sorghum Insect Management Guide.

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4. Potential for blackleg leaf spot in canola

Blackleg leaf spot has been observed in canola plots near Manhattan, Kansas (Figure 1). This is an intentional canola-on-canola study looking at control of different fungicide treatments. Nonetheless, conditions have been favorable for blackleg leaf spot development this year. For Kansas producers, blackleg would be of greatest concern in fields where canola has been grown before, where blackleg has been previously observed, and where tight crop rotations are being used (e.g. one year of wheat/one year of canola).

Figure 1. Canola plants showing some leaf loss from blackleg in a fungicide trial near Manhattan, Kansas on October 31, 2018 (Photo by Mike Stamm, K-State Research and Extension.

Once the blackleg fungus is present in a field, fruiting bodies called *pseudothecia* form on infected residue in the fall and spring. Pseudothecia release a type of spore known as *ascospores*. These spores can become airborne, starting the infection cycle in a developing canola crop. Because of the ascospore release, blackleg will spread to fields where it may not have been present. Weather conditions play a large part in how significant the ascospore release may be. Generally, cooler temperatures and wet weather, like we have seen in fall 2018, are conducive to widespread ascospore release. Blackleg may also be spread through infected seed, however use of a seed treatment at planting is one way to slow its spread.

Identification of blackleg

Beige-colored, round or irregularly shaped lesions will appear on older leaves (Photo 2). Upon closer inspection of the lesions, tiny black dots can be seen within the borders. These dots are *pycnidia*. From within these pycnidia, tiny spores known as conidia are released. Conidia are splashed by wind and rain onto the stems and leaves of nearby plants where new lesions will form. The areas of heaviest fall infection will likely show up as disease hot spots later in the growing season.

Figure 2. Beige, irregularly-shaped blackleg lesions showing picnidia on older canola leaves (Photo by Mike Stamm, K-State Research and Extension.

Once the lesions form on leaf and stem tissue, the fungus grows through the plant's vascular tissue to the crown where decay begins, causing the stem canker phase of the disease. Stem cankers are usually first observed in the spring as inconspicuous bluish lesions at a petiole scar near the soil line. The lesions develop into elongated, light brown sunken areas with purplish or black margins. As the lesions lengthen, stems become girdled and blackened.

Control options

Applying foliar fungicides when blackleg lesions are present in the fall is a common practice for canola producers. Some fungicides labeled for blackleg control are provided in Table 1. Generally, applications made in areas where disease pressure is greatest are more economical than applications made in areas where disease pressure is low. There are no thresholds for foliar applications in the fall, but if lesions are appearing on newly emerged canola leaves, then a foliar application may be justified.

Table 1. Foliar fungicides labelled for control of blackleg in canola.

Active Ingredient (MOA Group)	Common Name	Rate	Comments
Azoxystrobin (11)	Quadris	6.0 to 15.5 fl. oz.	Apply at the 2- to 4-leaf stage when leaf spot first appears.
Prothioconazole (3)	Proline 480SC	4.3 to 5.7 fl. oz.	Apply at the 2- to 4-leaf stage when leaf spot first appears.
Pyraclostrobin (11)	Headline	6 to 12 fl. oz.	Apply at the 2- to 4-leaf stage when leaf spot first appears.
Pyraclostrobin (11) + fluxapyroxad (7)	Priaxor	4 to 8 fl. oz.	Apply at the 2- to 4-leaf stage when leaf spot first appears.
*Adapted from 2017 OSU Extension Agents' Handbook of Insect, Plant Disease, and Weed Control. E-832. Oklahoma State University. **Consult product label for directions. Brand names used are for product identification purposes only.			

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5. As temperatures fall, what factors influence the survival of winter canola?

There was a narrow window for planting winter canola in fall 2018, starting with September rains and ending with heavy rains in October. Luckily, the September rains set the stage for favorable conditions for stand establishment. Soil moisture aids rapid emergence of canola, which is critical in attaining the right amount of top growth heading into the winter months. How could this, and other factors, affect the winter survival of canola?

Effect of canola size on winter survival

Canola overwinters -- and is the most tolerant to cold temperatures -- in the rosette growth stage. At this stage, the crown develops at the soil surface with larger, older leaves at the base and smaller, newer leaves at the center. The stem thickens but its length remains unchanged. For the greatest winter survival, a winter canola plant needs 5 to 8 true leaves, 6 to 12 inches of fall growth, a root collar diameter of ¼ to ½ inch, and an extensive root system. Hardened winter canola can withstand temperatures below 0 degrees F for short periods of time.

On the other hand, canola that has too much top growth (typically 20 inches or more) can succumb to winterkill for a number of reasons, including overuse of available soil water and nutrients, stem elongation above the soil surface, and physical damage to the unprotected crown as winter temperatures arrive.

Causes of excessive fall stem elongation

Stem elongation in the fall -- not to be confused with bolting, i.e. stem elongation with visible flowering structures -- may occur because:

- The crop was planted too early
- The crop was seeded at higher-than-optimal plant populations
- Excessive soil fertility is present (particularly nitrogen)
- An unusually warm fall persists
- Selection of a poorly adapted cultivar
- A combination of any of these factors

For example, closely spaced and crowded canola plants increase early plant-to-plant competition for light. This “reaching” for light may lead to an extension of the growing point above the soil surface. Any time the growing point (rosette) is elevated, the chances for winterkill are increased because overwintering plant parts are in an unprotected position above the soil surface.

Another factor in stem elongation and winter survival is the amount of surface residue present in the seed row. K-State research has shown that residue removal from the seed row is important for keeping the rosette close to the soil surface, especially in no-till cropping systems. Appropriate residue management (any method to remove residue from the seed row) greatly benefits winter survival.

Planting dates in 2018

Soil moisture conditions once again dictated planting dates for winter canola in 2018. September rains made soil moisture conditions ideal for planting (Figure 1), compared to 2017 when dry soils delayed planting. The biggest issue with planting canola in fall 2018 was waiting on soils to dry out. This could have delayed planting beyond the optimum window for some producers.

Figure 1. Winter canola plots were seeded into a stale seedbed with highly favorable moisture conditions near Kiowa, KS on September 24, 2018 (Photo by Mike Stamm, K-State Research and Extension).

Where canola was seeded on time, we are seeing adequate fall growth and there should be little initial concern for this crop going into the winter (Figure 2). As temperatures remain in the 50s and 60s with lows above freezing, this crop will continue to add leaf area before repeated hard freezes move it into dormancy.

Figure 2. Canola plots near Kiowa, KS on October 23, 2018. These plants have four true leaves and are continuing to add leaf area (Photo by Scott Dooley, K-State Research and Extension).

Temperatures have been cooler recently and warmer temperatures would actually benefit late-planted canola. We have already seen the first hard freeze of the season around October 15. Cosmetic damage to leaves (bleaching) and even plant loss has been observed where temperatures dropped below 28 degrees F for several hours. Plant loss would be the biggest concern on canola with 2 or fewer true leaves. At the South Central Experiment Field near Hutchinson, planting was delayed until September 28 because of wet soils (Figure 3). This is about a week later than when we would typically seed canola at this field. This plot is at the greatest risk for winter stand loss because of the current plant size.

Figure 3. Winter canola stands at the South Central Experiment Field, Hutchinson. These plants are smaller-than-normal for October 23 (Photos by Scott Dooley, Mario Secchi, and Ignacio Ciampitti, K-State Research and Extension).

Will the fields with small canola succumb to winterkill?

It is hard to answer this question because there are a number of factors that can affect winter survival. Good winter survival begins with selecting a winter hardy cultivar. Management of the crop, including planting date, fertilization, and seeding rate, can affect overwintering. The environment has probably the biggest influence and individual canola fields may see different effects from the cold. The ultimate low temperature and the duration of below-freezing temperatures are things to keep in mind when weighing what might happen. In addition, better survival is often seen when temperatures gradually drop versus rapidly drop. In the end, an interaction of all these factors will determine how the crop will overwinter. November is typically when canola begins to acclimate to winter conditions. Low temperatures at or below 30 degrees F are essential for winter hardening.

Cultivar differences in overwintering potential

Cultivar differences exist for fall vigor, the ability to avoid fall stem elongation, and winter survival, so it is important to consider these traits when considering what cultivar to grow. Hybrid cultivars tend to have quick establishment in the fall because of hybrid vigor. This is an important trait because it results in rapid plant development for overwintering. However, there can be a tradeoff between good fall vigor and too much fall growth, and this usually has to be managed by agronomic practices such as planting date and seeding rate. Planting later to take advantage of vigor may present challenges with winter survival if weather conditions are not favorable for fall growth.

The K-State Canola Breeding program has been selecting for cultivars that avoid fall stem elongation regardless of the planting date or seeding rate and this often translates into better winter survival. These cultivars have prostrate fall growth which keeps the crown (growing point) more protected at the soil surface. This trait could be especially useful in years when soil moisture conditions are ideal for planting but the calendar indicates it is too early to plant. We hope to broaden the planting window by planting these cultivars earlier while avoiding the risks of fall stem elongation and winterkill.

Current research

K-State agronomists are investigating production practices to help manage fall vigor and growth. We have recently completed studies evaluating seeding rate by cultivar (open pollinated vs. hybrid) in narrow and wide row spacing (9-in and 30-in). In these studies, winter survival was greater with reduced seeding rates, and yield was similar to that achieved with higher seeding rates. In narrow row spacing, seeding rates around 275,000 seeds per acre were optimal for hybrids and seeding rates around 375,000 seeds per acre were optimal for open-pollinated varieties. In wide row spacing, seeding rates should not exceed 300,000 seeds per acre.

We are evaluating different plant growth regulators and their ability to help manage fall growth. Using plant growth regulators to manage fall growth in winter canola is a common practice in the European Union (EU). In addition to the products, we are evaluating at what growth stage and at what rate do we apply these products in the fall.

Lastly, we are evaluating the effects of planting systems (planter vs. drill) under different seeding rates to better understand the effects of planting conditions and optimal number of plants under different soil and productivity environments.

Summary

Having too little or too much fall growth in winter canola depends on an interaction of the cultivar chosen, management practices, and the weather. Predicting the weather is challenging enough and this can be stressful on producers. Through breeding and production research at K-State, we hope to find improved ways to manage these risks in winter canola.

For addition information on canola production, please refer to the recently revised "Great Plain Canola Production Handbook" available through K-State Research and Extension.
https://www.bookstore.ksre.ksu.edu/pubs/MF2734.pdf

For more information about canola growth and development stages, please consult the K-State Canola Growth and Development poster:

https://www.bookstore.ksre.ksu.edu/pubs/MF3236.pdf

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