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04/13/2023

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 plant density adjustments for 2023

As the planting season for corn begins, producers need to decide their corn seeding rates. The plant density necessary to optimize yields (optimal plant density, or OPD) depends on the expected resource availability, primarily water and nutrients. For 2023, the critical factor is linked to the water availability at planting and the expected forecast for this season.

This is why plant density needs to be determined seasonally, depending on the expected growing conditions. In rainy years, a producer may increase the target seeding rate (to obtain a high plant density) and increase potential profit. Under dry conditions, farmers should consider cutting back on plant density. This applies primarily to dryland corn production and could be very relevant for this growing season.

In a previous eUpdate article, we discussed the importance of selecting the right seeding rate under different conditions across Kansas. In fact, we recommended reducing the seeding rate due to the drought forecasts. This year, farmers can get back to normal seeding rates for dryland corn.

The upcoming season is expected to be hotter and slightly above normal for precipitation (2023 outlook in Kansas) in much of the Corn Belt region, thus yield expectations and seeding rates should be adjusted accordingly.

Based on the weather forecasts released in March, farmers that reduced their seeding rates last year should do a minor adjustment to their plant densities this spring (1,000 to 2,000 more plants/acre) due to the expected weather conditions (Figure 1). Farmers that did not reduce their yields last year should operate as usual, using the same target seeding rates.

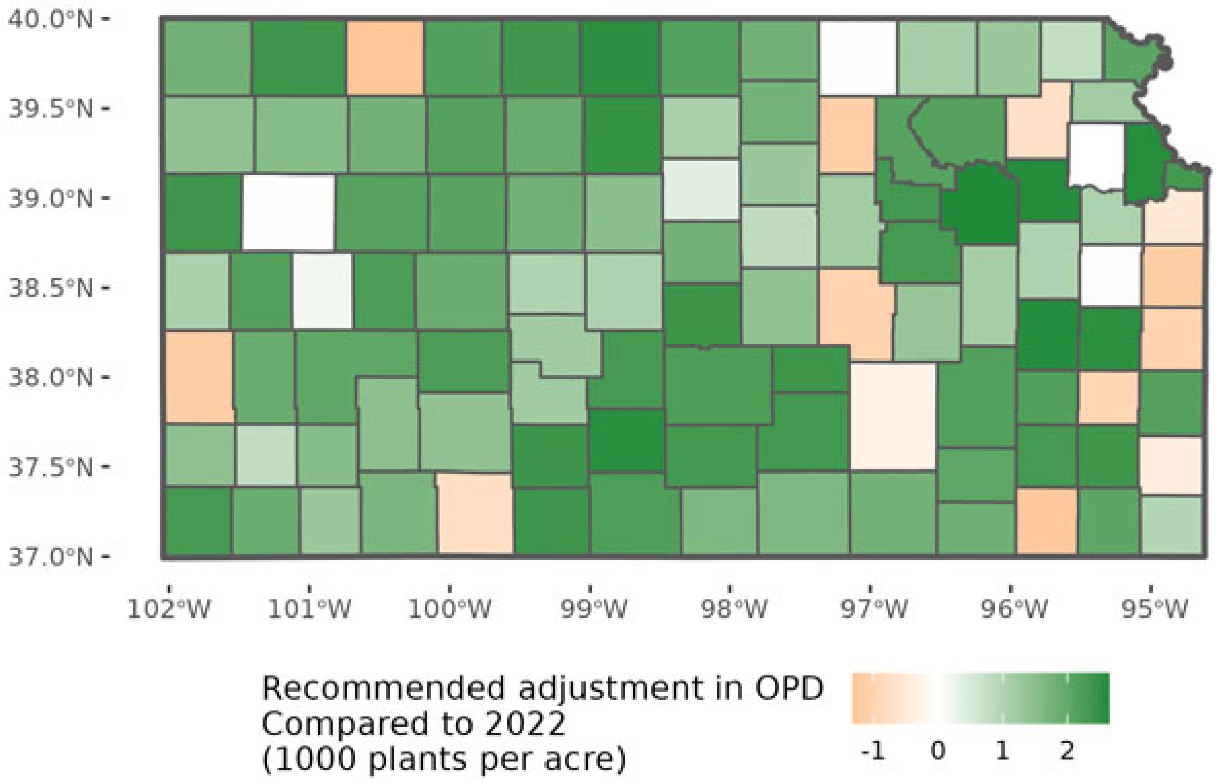

Figure 1. Change in the forecasted optimum plant density (OPD) for Spring 2023, relative to the optimum plant density for corn in 2022 (dry year) across the region and in Kansas. Colors represent whether the recommended change is to increase (green) or decrease (orange) the target plant density (OPD) from what was used last year. The upper panel shows the potential changes for the Corn Belt region, and the lower panel refers to Kansas's plant density changes.

In summary, 2023 is predicted to be a better season for Kansas, but the start of the season has been challenging with very dry conditions across the state. Farmers who did not reduce their seeding rates should operate as usual. Maintaining a similar seeding rate could be a good target based on the current conditions and the expected forecast.

The utilization of probabilistic and dynamic models such as the one presented here can help producers make real-time decisions to adjust inputs based on current soil moisture conditions and seasonal weather forecasts.

Ignacio Ciampitti, Farming Systems
ciampitti@ksu.edu

Josefina Lacasa, PhD student

lacasa@ksu.edu

2. Soybean planting date and maturity group selection

In the current 2023 season, soybean acreage projections in Kansas are up compared to historical. For maximizing yields, there are key practices we cannot overlook. This article presents some tips on selecting the best planting date and maturity group across Kansas.

After considering the effects of genetic yield potential and the environment, planting date is one of the primary management practices under the farmer's control that can highly influence soybean yields. In recent years, Kansas producers have been planting soybeans slightly earlier -- at the rate of about one-third-of-day per year. In 2022, the "50% planting date" mark was achieved around May 23 statewide (ahead of the 40% historical average) – with planting progress moving closer to mid-May if conditions are optimal at that time (USDA-Crop Progress Reports).

Planting dates and maturity group guidelines

Soybeans can be planted over a wide range of dates with adequate soil moisture conditions, although germination and emergence could be reduced and/or delayed in cool soils (less than 60°F). In the last few years, many farmers are anticipating soybean planting dates relative to the ones presented in Figure 1, in many situations planting soybeans before corn. The recommended maturity group varies across Kansas by area (Figure 2).

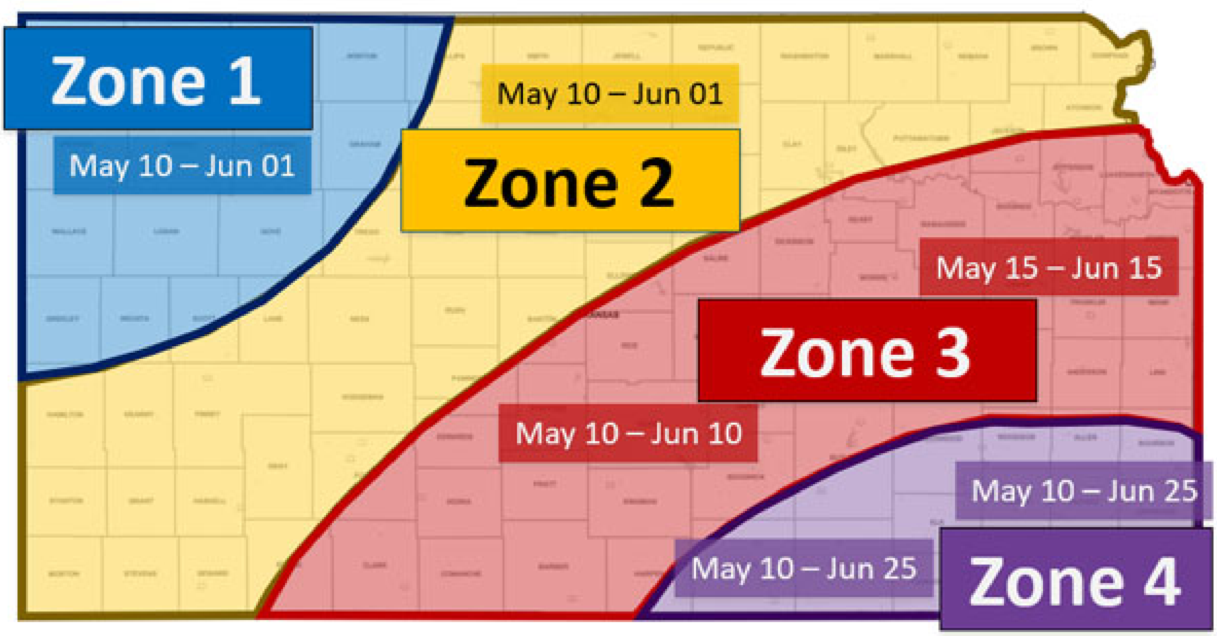

Figure 1. Recommended soybean planting dates under dryland conditions. K-State Research and Extension.

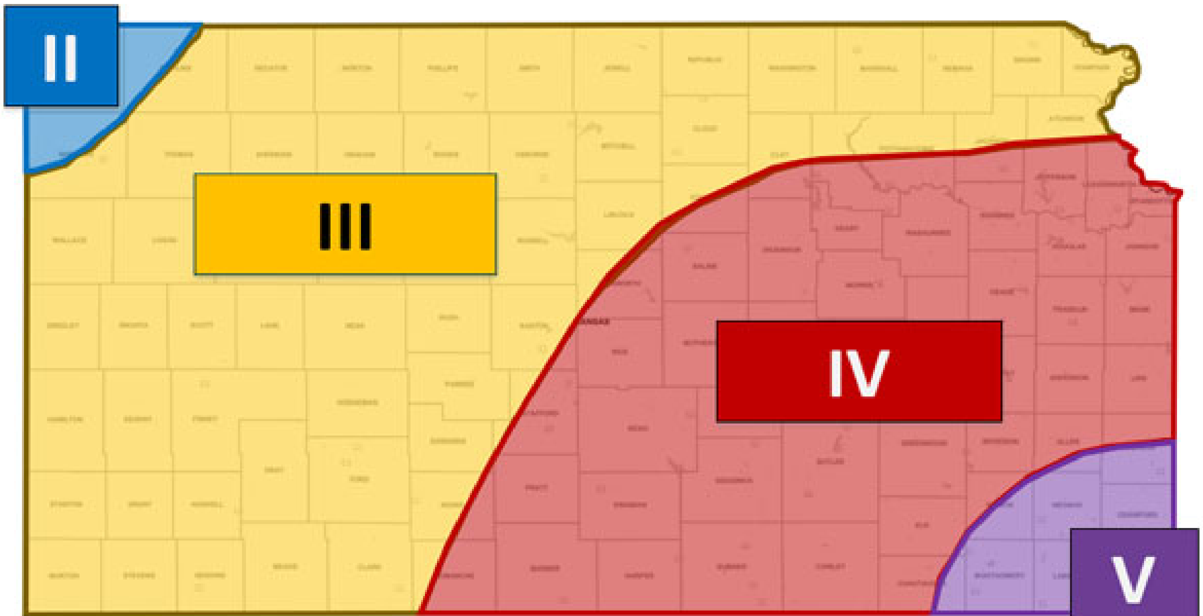

Figure 2. Recommended soybean maturity groups (II to V) across Kansas. K-State Research and Extension.

For Kansas, maximum soybean yield is reduced by 0.3 bu/a per day as planting dates get later in the season, with yield levels closer to 80-90 bu/a when planting in mid-April compared to 50 bu/a for planting in mid-July (Figure 3). These results highlight the importance of early planting for obtaining maximum yields and the overall yield penalty associated with delaying planting dates.

It is worth noting, however, that yields use to be considerably noisier (more variability) at the earlier planting dates. There is less variability and better yield "stability" for late-planted soybeans, although at lower potential yields (Figure 3).

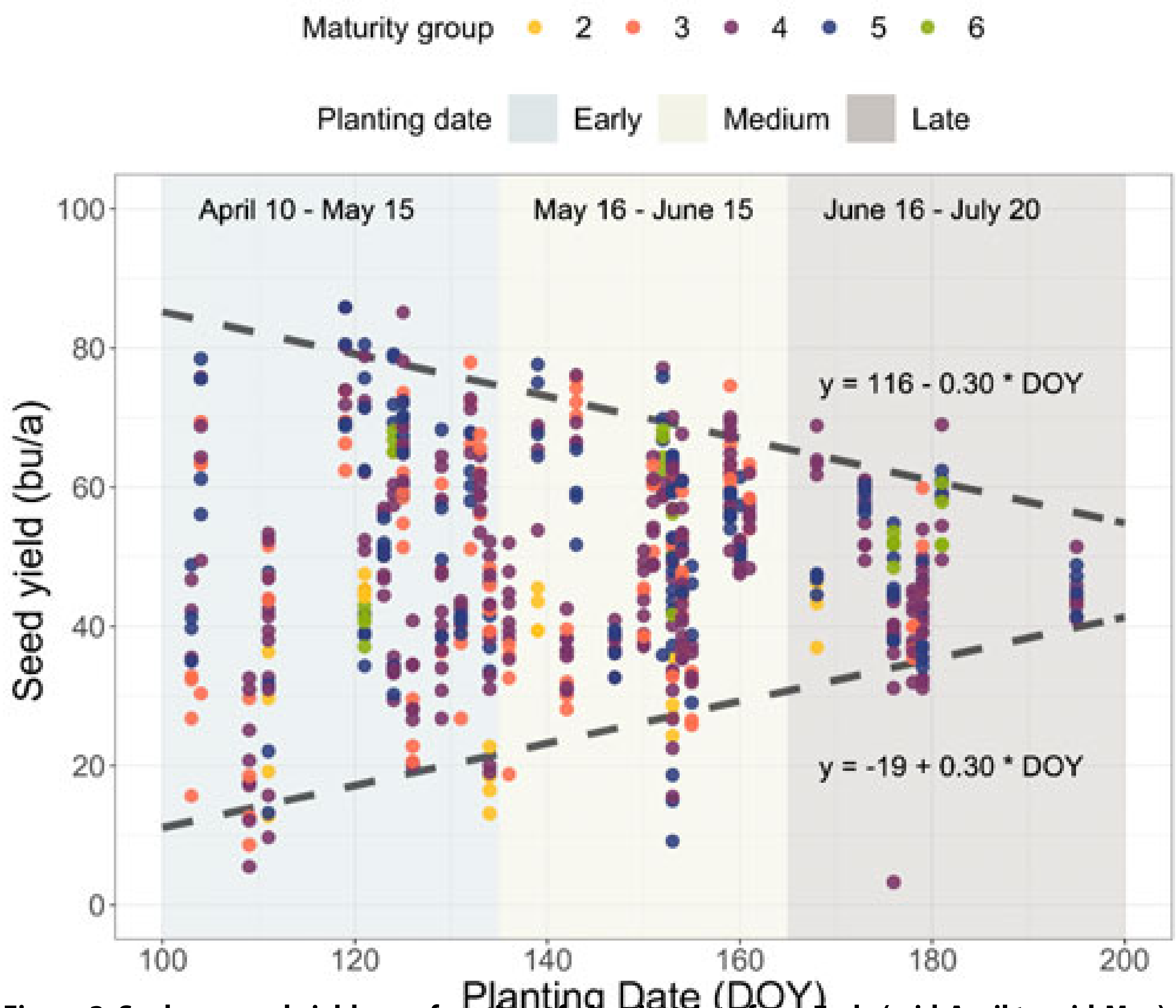

Figure 3. Soybean seed yields as a function of planting date from Early (mid-April to mid-May) to Medium (mid-May to mid-June) to Late (mid-June to mid-July) for a diverse set of maturity groups (from 2 to 6). Data from Ciampitti Lab, K-State Research and Extension.

This season, similar to 2022, farmers are planting soybeans earlier than usual, but a note of caution is that lower soil temperatures will reduce the speed of emergence and could compromise uniformity for soybeans. In addition, dry conditions in many areas of the state can further delay overall emergence and early season uniformity. A recent study completed by our research team showed that early-season plant-to-plant uniformity could compromise yields in soybeans, especially in low-yield environments (<35 bu/a). Similarly, at higher yield environments (where plants can express growth plasticity) such as in the east region of Kansas, a recent experiment from our previous growing season (2022) demonstrates that both early (May) and late planting (June) produced very similar average yield and variability (Figure 4).

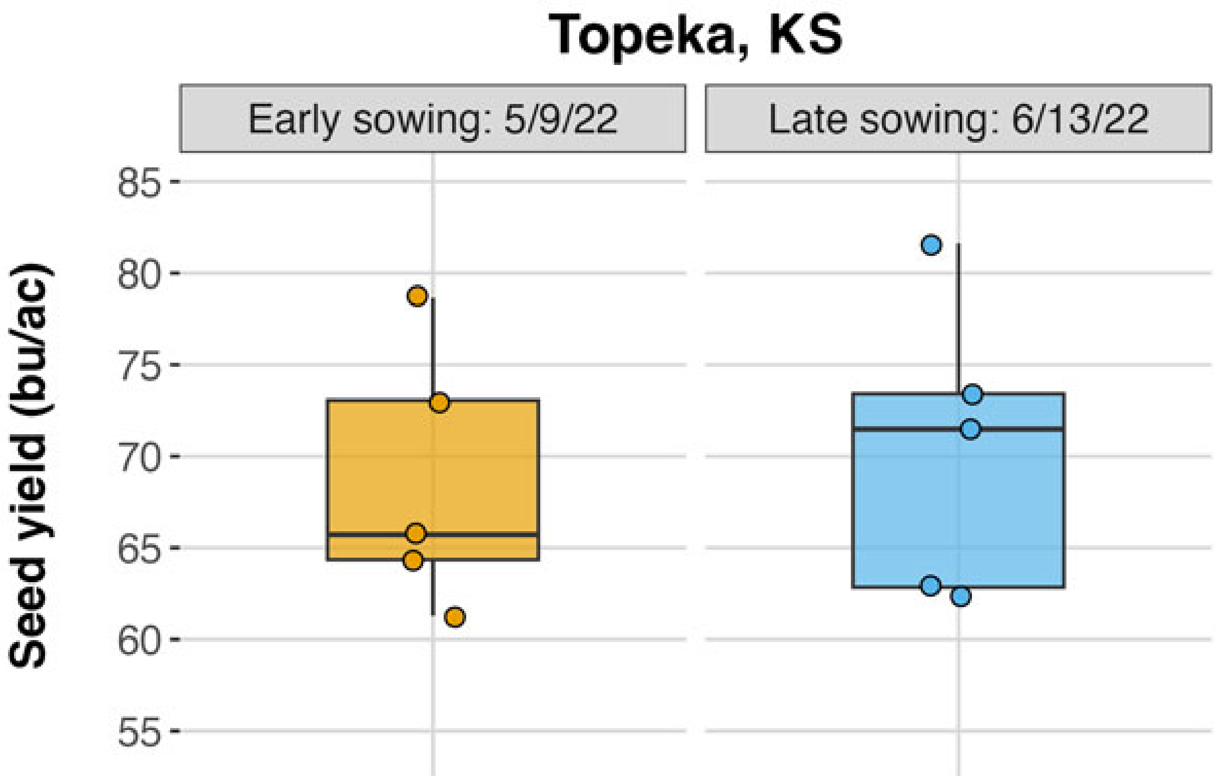

Figure 4. Soybean seed yield (bu/ac) comparing early (May) and late (June) at the Kansas River Valley Research Station, Topeka, KS. 2022 cropping season. Graph from Ciampitti Lab, K-State Research and Extension.

Final considerations

- Ultimately, weather patterns dictate soybean yields, especially under dryland conditions. There is no guarantee that any certain planting date will always work out best for soybean yields in Kansas. In fact, the distribution and amount of rainfall and the day/night temperature variations around flowering and during the grain-filling periods have significant impacts on soybean yields. Thus, when the risk of drought stress during the growing season is high, diversifying planting dates may be a good approach to consider.
- When planting early (many farmers are trying to plant soybeans before corn), the seed should be treated with a fungicide and insecticide. Selecting varieties with resistance to soybean cyst nematode and sudden death syndrome is advisable. Do not plant in soils that are too wet. Also, do not plant until soil temperatures are close to 60°F. If planted into soils cooler than 60°F, seedlings may eventually emerge but will have poor vigor.
- In drier areas of Kansas and on shallow soils, yields have been most consistent when planting soybeans in late May to early June. By planting during that window, soybeans will bloom and fill seed in August and early September, when nights are cooler and the worst of heat and drought stress is usually over.

Ignacio Ciampitti, Farming Systems
ciampitti@ksu.edu

Adrian Correndo, Postdoctoral Fellow
correndo@ksu.edu

Emmanuela van Versendaal, MS Student
evanversendaal@ksu.edu

Luiz Felipe Antunes de Almeida, MS Student
luizfelipeaa@ksu.edu

3. Causes of yellow wheat - Soil fertility factors

Wheat producers may start seeing some wheat fields turn yellow during this time of the year. The pattern may vary from field to field, sometimes as large areas, small patches, or streaks of yellowish wheat in some fields this spring. What are some of the main causes related to nutrients and soil fertility for yellow wheat in the spring?

Nitrogen deficiency. As the crop starts to grow in the spring, its nitrogen (N) demand increases and it is common to see N deficiency, especially while the temperatures are lower and not much N is mineralized from the soil organic matter. Nitrogen deficiency causes an overall yellowing of the plant, with the lower leaves yellowing and dying from the leaf tips inward (Figure 1). Nitrogen deficiency also results in reduced tillering, top growth, and root growth. The primary causes of N deficiency are insufficient fertilizer rates, application problems, applying the nitrogen too late, leaching from heavy rains, denitrification from saturated soils, and the presence of heavy amounts of crop residue, which immobilize nitrogen.

Figure 1. Nitrogen deficiency on wheat. The lower leaves are the first to become chlorotic (yellow). Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Sulfur deficiency. Similar to nitrogen, the crop's sulfur requirement increases in the spring as it takes off on reproductive growth. Due to a decrease in sulfur deposition in the rainfall, there has been an increasing number of fields with sulfur deficiency symptoms in Kansas in recent years. Deficiencies can be more common in areas where organic matter levels are low -- especially on sandier soils or eroded areas of a field. Sulfur deficiency can also occur where soils are cold in the spring due to a reduced rate of release of sulfur from organic matter. The symptoms of sulfur deficiency are very similar to nitrogen deficiency. However, sulfur deficiency differs from N deficiency in that the whole plant is pale, with a greater degree of chlorosis (yellowing of plant tissue) in the young/upper leaves (Figure 2). The pattern of chlorosis may show gradation in intensity with the younger leaves at the tip yellowing first because sulfur is not easily translocated within the plant. But the entire plant can quickly become totally chlorotic and take on a light yellow color. Symptoms often become more pronounced when plants begin growing rapidly while soil conditions are such that organic matter mineralization and sulfur release rates are low. Symptoms may disappear as the temperature warms up and moisture conditions improve, which increases the rate of mineralization of sulfur from organic matter and the rate of root growth.

Figure 2. Sulfur deficiency in wheat, with symptoms appearing first on the younger leaves. Photo by Romulo Lollato, K-State Research and Extension.

Low pH and poor root growth. Many potential causes exist for reduced root growth: dry soils and later sowing are common situations this year. Root damage due to aluminum toxicity in acidic soils can also result in multiple deficiency symptoms and poor growth (Figure 3). Strongly acidic soils may present several problems for wheat production. These include the combination of aluminum toxicity as well as deficiencies of phosphorus, calcium, magnesium, and molybdenum. These problems caused by acid soils are difficult to separate one from another and are often related to root damage due to Al toxicity. In general terms, aluminum toxicity will reduce the yield potential of wheat when soil pH levels get below 5.2 to 5.5 and KCl-extractable (free aluminum) levels are greater than 25 parts per million (ppm).

Typically, these symptoms become apparent in early spring and are exacerbated by drought such as this spring. Although the wheat crop may recover from this condition with sufficient moisture, the impact on yields may have already occurred. A corrective measure will require a lime application for the next crop.

Figure 3. Wheat growing on very acidic soils, such as this soil in Harper County with a pH of 4.6, is often spindly and has poor vigor. Photos by Dorivar Ruiz Diaz, K-State Research and Extension.

Dorivar Ruiz Diaz, Nutrient Management Specialist
ruizdiaz@ksu.edu

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu

4. Causes of yellow wheat - Weather and disease factors

Wheat producers may start seeing some wheat fields turn yellow during this time of the year. The pattern may vary from field to field, sometimes as large areas, small patches, or streaks of yellowish wheat in some fields this spring. What are some of the main weather and disease-related factors that can cause yellow wheat in the spring?

Poor root growth. Many potential causes exist for reduced root growth: dry soils, later sowing, waterlogging, or elevated crown height caused by shallow planting depth or excessive residue in the root zone (Figure 1). If the plants have a poor root system, then the root systems are not extensive enough to access enough water and nutrients, causing the plant to turn yellow. More information on poor root growth associated with soil fertility factors can be viewed in a companion article in this eUpdate issue.

Figure 1. The left panel shows the lack of development of the crown rooting system of a wheat field due to drought conditions in the topsoil. Photo by Romulo Lollato, K-State Research and Extension. The right panel shows a slightly more developed but also extremely shallow rooting system, likely due to a restrictive dry topsoil layer. Photo by Tyler Ediger, wheat producer in Meade County, KS.

Cold weather injury at the tillering stage. A sudden drop in temperatures after the wheat has greened up but before it reaches the jointing stage will burn back the top-growth, often giving the field a yellowish cast but not necessarily reducing yield potential (Figure 2). This injury is likely cosmetic, provided the growing point is still healthy. Variety release from winter dormancy can also affect the extent of the symptoms, as early varieties would have been less cold-hardy and thus likely sustain more injury.

Figure 2: Yellowing wheat from cold weather injury at the tillering stage. Wheat variety on the left (WB-Grainfield) has a later release from winter dormancy as compared to WB-Cedar (variety depicted on the right). Thus, WB-Cedar sustained more leaf injury. Photo by Romulo Lollato, K-State Research and Extension.

Freeze injury at the jointing stage. Jointing wheat can usually tolerate temperatures in the mid-to-upper 20s with no significant injury. But, if temperatures fall into the low 20's or below for several hours, the lower stems, leaves, or developing head can sustain injury (Figure 3). This has not been a problem this year yet, but in some cases, there are severe temperature drops in the near future as the crop greens up and joints, producers should scout their fields to assess the yield potential. If the leaves of tillers are yellowish when they emerge from the whorl, this indicates those tillers have been damaged.

Figure 3. Comparison between a healthy developing wheat head (left-hand side, typically light green and firm) versus a developing wheat head that sustained freeze injury (right-hand side, whitish/brown and mushy). Photo by Romulo Lollato, K-State Research and Extension.

While the extent of potential freeze damage depends on minimum temperatures achieved, duration of cold temperatures, and stage of wheat development; other factors such as crop residue, position on the landscape, wind speed, snow cover, and soil temperatures also play a role. Figure 4 shows an example of the effect of heavy residue on potential wheat damage. In this photo, parts of the field with a heavier layer of residue show greater cold damage than lighter residue. This can be partially explained because, under a thicker layer of residue, the wheat crown tends to form closer to the surface and therefore is more exposed to freezing temperatures.

Figure 4. Effect of soil residue on wheat freeze damage. Wheat is showing more damage from freezing temperatures in thicker residue layers. Photo by Tyler Ediger, wheat producer in Meade County, KS.

Leaf senescence and opportunistic leaf spotting diseases. After the winter, it is normal for some of the leaves in the lower canopy to go through senescence and perish, sometimes translocating nutrients to the new growth and sometimes just due to different natural reasons. This causes a yellowing of the lower wheat canopy. Some opportunistic saprophytic fungi or fungal diseases such as leaf spots (Septoria tritici blotch, Stagonospora nodorum leaf blotch, and tan spot), may colonize these dying tissues as shown in Figure 5. For the most part in Kansas, these diseases do not cause economic damage as long as they remain on the lower leaves, especially if they occur in tissue that is dying already. They might become a problem and warrant a fungicide application in specific situations, such as when a susceptible variety is planted into heavy wheat residue – especially under no-tillage practices, and when symptoms appear in the upper canopy after the flag leaf has emerged (see Stagonospora nodorum leaf blotch, in Figure 6).

Figure 5. Septoria tritici blotch (leaf spot) colonizing tissue from the lower wheat canopy that was already senescing. Photo by Romulo Lollato, K-State Research and Extension.

Figure 6. Stagonospora nodorum leaf blotch symptoms in the upper wheat canopy. Photo by Romulo Lollato, K-State Research and Extension.

Soilborne mosaic or spindle streak mosaic. Soilborne mosaic and spindle streak mosaic (Figure 7) are viral diseases that occur primarily in eastern and central Kansas but are rare in western Kansas. These diseases are most common in years with a wet fall, followed by a cool, wet spring. These diseases are often most severe in low areas of a field where soil conditions favor infection. Symptoms are usually most pronounced in early spring, then fade as temperatures warm. Leaves will have a mosaic of green spots on a yellowish background. Infected plants are often stunted in growth. Many varieties in the eastern part of the state have high levels of resistance to these viral diseases.

Figure 7. Wheat with symptoms of wheat spindle streak mosaic. Notice the yellow, linear lesions that are tapered at both ends. Photo by Erick DeWolf, K-State Research and Extension.

Wheat streak mosaic complex. This viral disease is vectored by the wheat curl mite. Yellow areas in the field will appear in spring around the jointing stages of growth; usually on field edges adjacent to volunteer wheat. Leaves will have a mosaic of yellow streaks, stripes, or mottling (Figure 8). Plants infected with wheat streak mosaic are often smaller than healthy plants. There are two additional viruses, Triticum mosaic virus and high plains mosaic virus, that also result in similar symptoms.

Figure 8. Typical symptoms of wheat streak mosaic virus. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Barley yellow dwarf. This viral disease is vectored by bird cherry oat aphids and greenbugs. Small or large patches of yellow plants will occur, typically around the boot stage (Figure 9). The leaf tip turns yellow or purple, but the midrib remains green. The yellowing caused by barley yellow dwarf is less botchy than the yellowing caused by other viral diseases. Plants infected by barley yellow dwarf are often stunted.

Figure 9. A typical patch of plants showing symptoms of barley yellow dwarf virus infection. (Photo by Romulo Lollato, K-State Research and Extension) as well as up-close symptoms of barley yellow dwarf (Photo by Kelsey Andersen Onofre, K-State Research and Extension)

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu

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

Erick DeWolf, Plant Pathologist
dewolf1@ksu.edu

5. Planting winter canola? Be aware of rotation restrictions with herbicides

Recent developments associated with market opportunities for winter canola may lead to increased planting in the fall of 2023. As you make seeding plans, be sure to consider the herbicides you use in your summer crops. Table 1 highlights some herbicides used in summer crops that may or may not have rotation restrictions for canola. As you consider this information, please remember that the rotation intervals required by the EPA only consider the time that is required to ensure no illegal herbicide residues are found in the second crop. However, in some cases, additional information can be provided by the herbicide registrant regarding the potential for injury. When appropriate, that information will be noted in Table 1.

Table 1. Active ingredients, field half-lives, and crop rotation intervals of some herbicides applied to summer crops that may be of concern for winter canola.

Herbicide	Active ingredient	Crop use	Half-life (days)	Rotation interval	Comments
Aatrex, others	atrazine	Corn, grain sorghum	29	one year to avoid crop injury	
Ally, others	metsulfuron	grain sorghum, wheat	13	34 months and at least 28" precipitation	Less if successful bioassay
Amber, others	triasulfuron	wheat	39	at least 4 months	Also requires bioassay
Balance Flexx, others	isoxaflutole	corn	1.3	18 months	Also requires 15" of precipitation
Beyond, others	Imazamox	Clearfield wheat, soybean	17	26 months	18 months for Clearfield canola
Callisto, others	mesotrione	corn	5	10 months	
Classic	chlorimuron	soybean	28	9 to 18 months	See label for details
Talinor, Acuron (others)	bicyclopyrone	corn, wheat	213	18 months	
Dimetric, others	metribuzin	soybean	19	18 months	
Dual II Magnum, others	metolachlor	corn, grain sorghum, soybean	23	12 months	
Glean, others	chlorsulfuron	wheat	36	bioassay required	
Harmony, others	thifensulfuron	wheat	10	45 days	
Harness, Warrant, others	acetochlor	corn, grain sorghum, soybean	12	Not listed	
Outlook, others	dimethenamid	corn, grain	16	4 to 6 months	Interval increases

		sorghum, soybean			with increasing rate
Permit, others	halosulfuron	corn, grain sorghum	14	15 months	Bioassay if drought or cool conditions prevail
Python, others	flumetsulam	corn, soybean	45	26 months	Also requires bioassay
Spartan, other	sulfentrazone	soybean	541	24 months	
Valor, others	flumioxazin	soybean, fallow, burndown	18	6 or 12 months	6 months if tilled
Zidua, others	pyroxasulfone	corn, soybean, wheat	22	12 to 18 months	Interval increases with increasing rate
FirstRate	cloransulam	soybean	10	18 months	
Pursuit	imazethapyr	soybean	51	40 months	Also requires bioassay
Reflex	fomesafen	soybean	86	18 months	

For more detailed information, see the "2023 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide available online at https://bookstore.ksre.ksu.edu/pubs/SRP1176.pdf or check with your local K-State Research and Extension office for a paper copy.

For more information on canola planting considerations, see the "Great Plains Canola Production Handbook" available at https://www.bookstore.ksre.ksu.edu/pubs/mf2734.pdf.

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.

Sarah Lancaster, Weed Management Specialist
slancaster@ksu.edu

Mike Stamm, Canola Breeder
mjstamm@ksu.edu

6. Monitor alfalfa weevils using degree days and scouting

Alfalfa weevil activity began early this year for our Oklahoma neighbors and it appears that degree day accumulation for Kansas alfalfa weevils is well ahead of normal for most locations in the state. Only northwest Kansas is at or slightly behind normal (Table 1). There were reports of treatable infestations in south-central Kansas during the last week of March and getting towards the middle of April, fields are being treated, or close to being treated, in the central, southeast, and northeast regions of the state.

Alfalfa weevil degree days are a great way to estimate what might be going on in the field and serve as a useful tool to know when to time scouting. Alfalfa weevil eggs begin hatching after 300 degree days have accumulated (Table 2). Since we cannot determine if the eggs present were laid the previous fall or the current spring, in Kansas, scouting should start after 180 degree days have accumulated starting from January 1.

Be aware of insecticide resistance

While warmer spring temperatures have allowed for faster alfalfa weevil development, at the same time in some areas dramatic temperature fluctuations have slowed down alfalfa growth making the plants unable to keep up with feeding damage. In shorter fields, between 3 and 7 inches tall, treatment may be warranted when feeding is evident on the top inch of growth and 1 to 2 larvae are present. If a field is treated, it is important to verify that the expected amount of control was achieved. In 2020, populations of alfalfa weevil resistant to lambda-cyhalothrin were verified in northwest and southwest Kansas as well as Oklahoma. While this resistance has not appeared to become a widespread problem for Kansas producers, Oklahoma continues to have resistance statewide and it appears resistance to zeta-cypermethrin is developing there. There are numerous products available for alfalfa weevil control in Kansas (Table 3). When making management decisions it is important to rotate modes of action as this is an effective way to prevent the development of resistance.

For the most up-to-date alfalfa weevil degree day accumulations, visit the Kansas Mesonet Alfalfa Weevil Degree Day Calculator (https://mesonet.k-state.edu/agriculture/degreedays/). For a complete guide to alfalfa weevil management recommendations please refer to the 2023 Alfalfa Insect Pest Management Guide.

Table 1. Alfalfa weevil degree days as of April 12, 2023. Kansas Mesonet, 2023: Kansas Mesonet Alfalfa Weevil Degree Days Accessed 12 April 2023, http://mesonet.k-state.edu/agriculture/degreedays/

	Accumulated Alfalfa Weevil Growing Degree Days			
	Station	**Actual**	**Normal**	**Departure**
Northwest	Cheyenne	203	216	-13
	Colby	238	211	27
Southwest	Garden City	422	286	136
	Meade	591	291	300

North-central	Hays	356	238	119
	Osborne	333	198	135
South-central	Hutchinson	441	239	202
	Harper	540	292	248
Northeast	Manhattan	357	218	139
	Corning	301	183	118
Southeast	Cherokee	546	269	277
	Woodson	456	245	211

Table 2. Approximate degree days required for alfalfa weevil development. Excerpt from Whitworth et. al., Alfalfa Weevils, Kansas State University, October, 2022 (MF2999).

Degree Days or Thermal Units	Stage	Importance
25–300	Eggs hatch	In stems
301–450	1st and 2nd instars	Leaf pinholing – start sampling
450–600	2nd and 3rd instars	Defoliation
600–750	3rd and 4th instars	Defoliation
750+	Pupa to adult	Adults – some feeding – oversummering

Table 3. Products registered in Kansas for control alfalfa weevil. Treatments listed are mainly used for treating alfalfa weevil larvae; products with an asterisk are also recommended for adult alfalfa weevil control. For more specific information relative to any insecticide, always refer to the actual label on the product.

Trade Name	Chemical Name	Mode of Action Class
Fastac CS	*Alpha-cypermethrin*	3A
Baythroid XL	*Beta-cyfluthrin*	3A
Tombstone	*Cyfluthrin*	3A
Proaxis	*Gamma-cyhalothrin*	3A
Steward	*Indoxacarb*	22A
Warrior II w/Zeon Tech	*Lambda-cyhalothrin*	3A
Besiege	*Lambda-cyhalothrin + chlorantraniliprole*	3A+28
Lannate	*Methomyl*	1A
Imidan 70-W*	*Phosmet*	1B
Mustang MAXX	*Zeta-cypermethrin*	3A

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

7. Kansas Ag-Climate Update for March 2023

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

March 2023: Drought persists in more than 80% of the state

The average temperature for March was 42.2°F or 2.6°F below normal. This ranked as the 57th coolest March out of 129 years of records, dating back to 1895. All divisions were below normal, with anomalies ranging from -4.9°F (northwest) to -1.5°F (southeast).

The average precipitation for March was 0.54 inches, which was 1.25 inches below normal. This ranked as the 14th driest March on record. All divisions were below normal. Southwest Kansas had the least precipitation (0.11", 9% of normal), while south central Kansas had the lowest percentage of normal (0.12", 6%). This was the 4th driest March in 129 years in south central Kansas and the 9th driest in southwest Kansas.

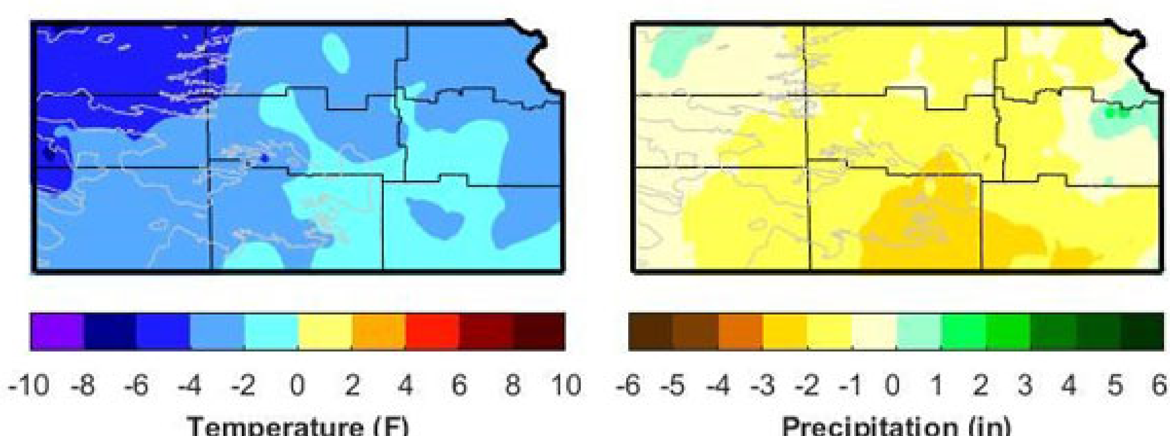

Figure 1. Departures from normal temperature (°F) and precipitation (inches) for March 2023.

View the entire March 2023 Ag-Climate Update, including the accompanying maps and graphics (not shown in this eUpdate article), at http://climate.k-state.edu/ag/updates/

Xiaomao Lin, State Climatologist
xlin@ksu.edu