Issue 852

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Research and Extension

Extension Agronomy

eUpdate

04/29/2021

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. Soil temperature and forecast are critical for successful cotton stand establishment

Cotton has a great ability to overcome many stresses and produce profitable lint yields when the crop gets off to a good, uniform start. So, when is the "best" time to plant cotton to meet those criteria?

First, much as with corn, the goal is to achieve an acceptably uniform and optimal stand. The recommended window for cotton planting is relatively narrow compared to that for other summer crops grown in Kansas – roughly May 1 through June 5. However, it is best to monitor soil conditions rather than the calendar. You can monitor soil temperature information on the Kansas Mesonet (http://mesonet.k-state.edu/agriculture/soiltemp/). For a variety of reasons, including seedling chilling, potential herbicide injury, thrips and seedling diseases, it pays to plant when growers can not only get an adequate stand, but also when the crop will grow vigorously.

Soil temperature and the 10-day forecast are two major factors to that fast start. Cotton seed germination and early growth/emergence is favored by soil temperatures above 64°F and adequate, but not excessive, soil moisture. Based on USDA-ARS research work at Lubbock, TX, the seedling cotton requires more than 100 hours above 64°F at the seed level to emerge.

In Kansas, we often use 60°F as our baseline temperature at seed level. Current 2-inch soil temperatures indicate that threshold is approaching, particularly in the Southwest (Figure 1). The 6-10 weather outlook favors cooler-than-normal temperatures for the period, which will slow warming of the soils.

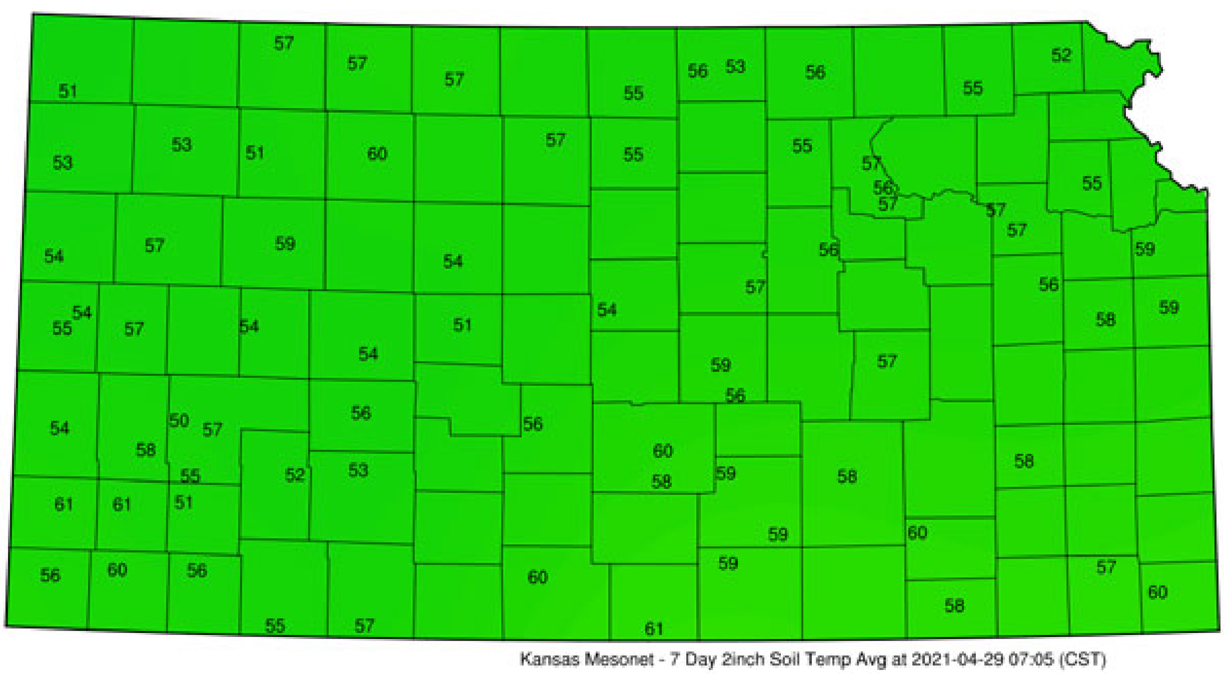

Figure 1. Average 2-inch soil temperatures for the week ending April 29, 2021 from KS Mesonet

In addition to considering soil temperature, growers should be planting high quality varieties (e.g. high cold germination and large seed size, with good cold tolerance and early season vigor ratings).

Information from North Carolina State University's cotton web page illustrating the importance of heat unit accumulation immediately following planting is shown in Table 1.

Table 1. Relationship between predicted DD-60s and Planting Conditions (Source: North Carolina State University, https://cotton.ces.ncsu.edu/)

Predicted DD-60 accumulation for five days following planting	Planting conditions
10 or less	Very Poor
11 – 15	Marginal
16 – 25	Adequate
26 – 35	Good
36 – 49	Very Good
50	Excellent
Avoid planting cotton if the low temperature is predicted to be below 50°F for either of the two nights following planting or predicted daily DD-60s is near zero for the day of planting.	

Effects of cold soil on cotton seeds

Cotton seed subjected to cold the first 2-3 days after planting, OR when the seed is imbibing moisture from the soil, is susceptible to imbibitional chilling injury. Cotton seed contains lipids which must be converted to energy, and cell membranes must develop properly. If soil temperatures drop below 50°F during this critical germination period, seedlings may suffer damage. The first 30 minutes after planting, the seed will absorb up to 60% of the water necessary for germination. Cold soil temperatures (<45°F to 50°F) will most likely lead to injury or seedling death. Damage may result in malformed seedlings, loss of or damage to the taproot, and a greater likelihood of seedling disease problems. Injury usually kills the root tip meristematic tissue which stops normal taproot growth and leads to lateral root development (Figure 2). If the plants survive, the root system will not develop normally.

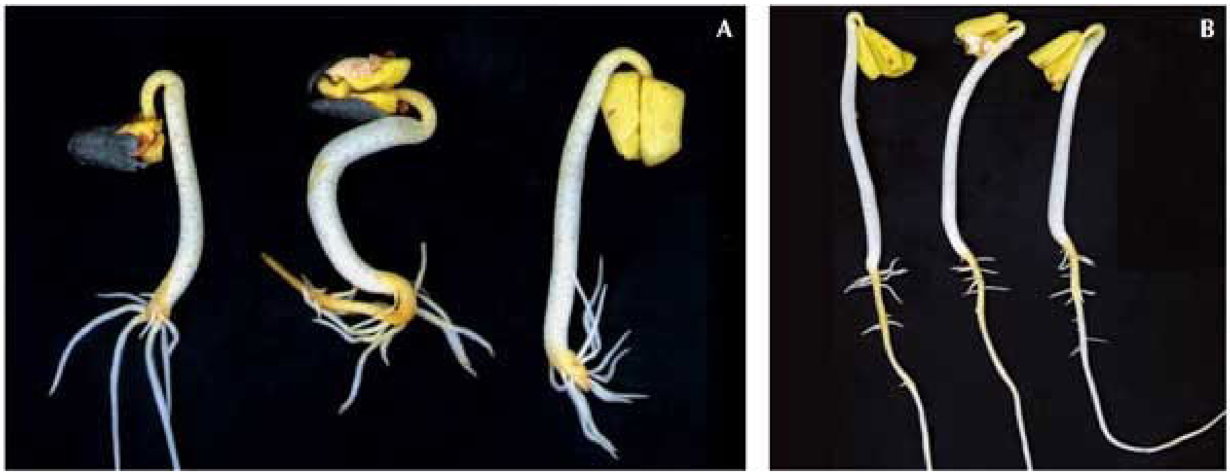

Figure 2. Cotton seedlings subjected to chilling temperatures (A) compared to seedlings not chilled (B) during imbibition from a study conducted by Hopper and Burke. Note the absence of normal taproot growth of the seedlings in A. Seedlings in A and B were exposed to the same temperature (86°F) with the exception of the first six hours of imbibition in which seedlings in A were exposed to chilling temperatures of 40°F. Photos by N. Hopper, Texas Tech University and J. Burke, USDA-ARS, Lubbock, TX.

References

R. Boman and R. Lemon. 2005. Soil Temperatures for Cotton Planting. *Agri*LIFE Extension. Texas A&M System. http://cotton.tamu.edu/General%20Production/scs-2005-17%20Soil%20Temp.pdf

K. Edmisten & G. Collins: https://cotton.ces.ncsu.edu/2019/04/cotton-planting-conditions-april-25-2019/

B. Robertson, S. Stewart, & R. Boman. 2007. Planting and Replanting Decisions. Cotton Physiology Today. https://agrilifecdn.tamu.edu/lubbock/files/2011/10/cptvol13no12007.pdf

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2. Stripe rust distribution and risk assessment - April 29, 2021

With the wheat crop moving into the flag leaf stage in central Kansas, and heading in the south, now is a critical time to assess the need for a foliar fungicide application. Scouting efforts from across Kansas have reported several new occurrences of stripe rust this week, although incidence remains extremely low in many counties such as Russel, Ellsworth, Saline, Rice, and Geary (Figure 1).

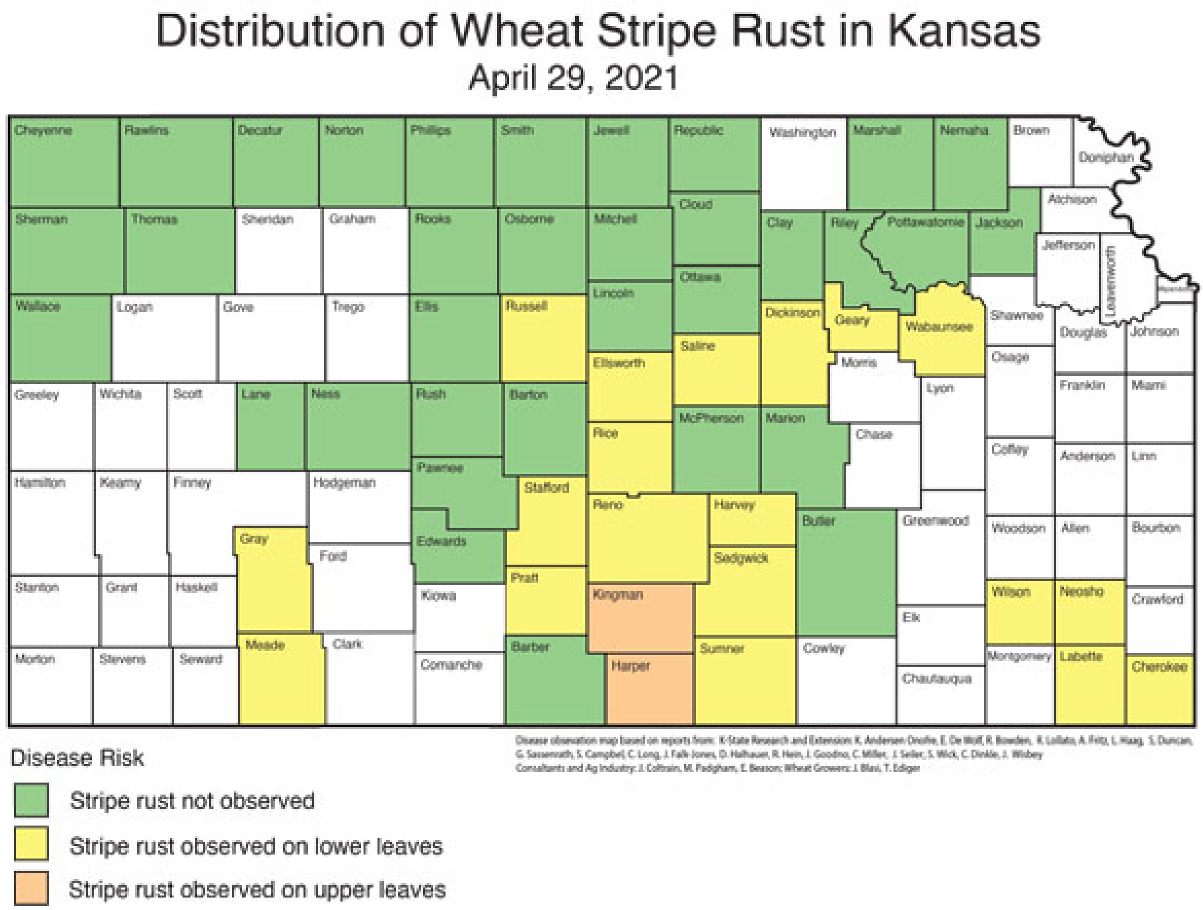

Figure 1. Distribution of stripe rust in Kansas as of April 29, 2021. Map is based on observations of K-State Research and Extension, crop consultants, and wheat producers in the state. Map created by Kelsey Andersen Onofre, K-State Research and Extension.

Stripe rust is most yield-limiting when it advances to the upper canopy, particularly the flag leaf. The risk of stripe rust causing yield loss is a function of three things:

1. Timing of first local disease detection in relation to crop growth stage (earlier detection = higher risk)
2. Weather conditions: specifically, moisture and relative humidity after first detection
3. Variety genetics: varieties with better resistance ratings will, in general, benefit less from a fungicide application. Variety ratings can be found in the K-State Wheat Variety Disease and Insect Rating Guide: https://bookstore.ksre.ksu.edu/pubs/MF991.pdf

Stripe rust risk assessment for the coming weeks

Here we integrate current stripe rust reports, risk due to recent weather conditions (relative humidity and rainfall), and crop growth stage to assess the current risk of severe stripe rust in Kansas (Figure 2). The high-risk regions (dark purple) correspond to regions where weather has been particularly suitable for stripe rust establishment, and where the pathogen has been detected for sufficient time. The risk in other parts of the state may change as the season progresses and as more favorable weather events accumulate.

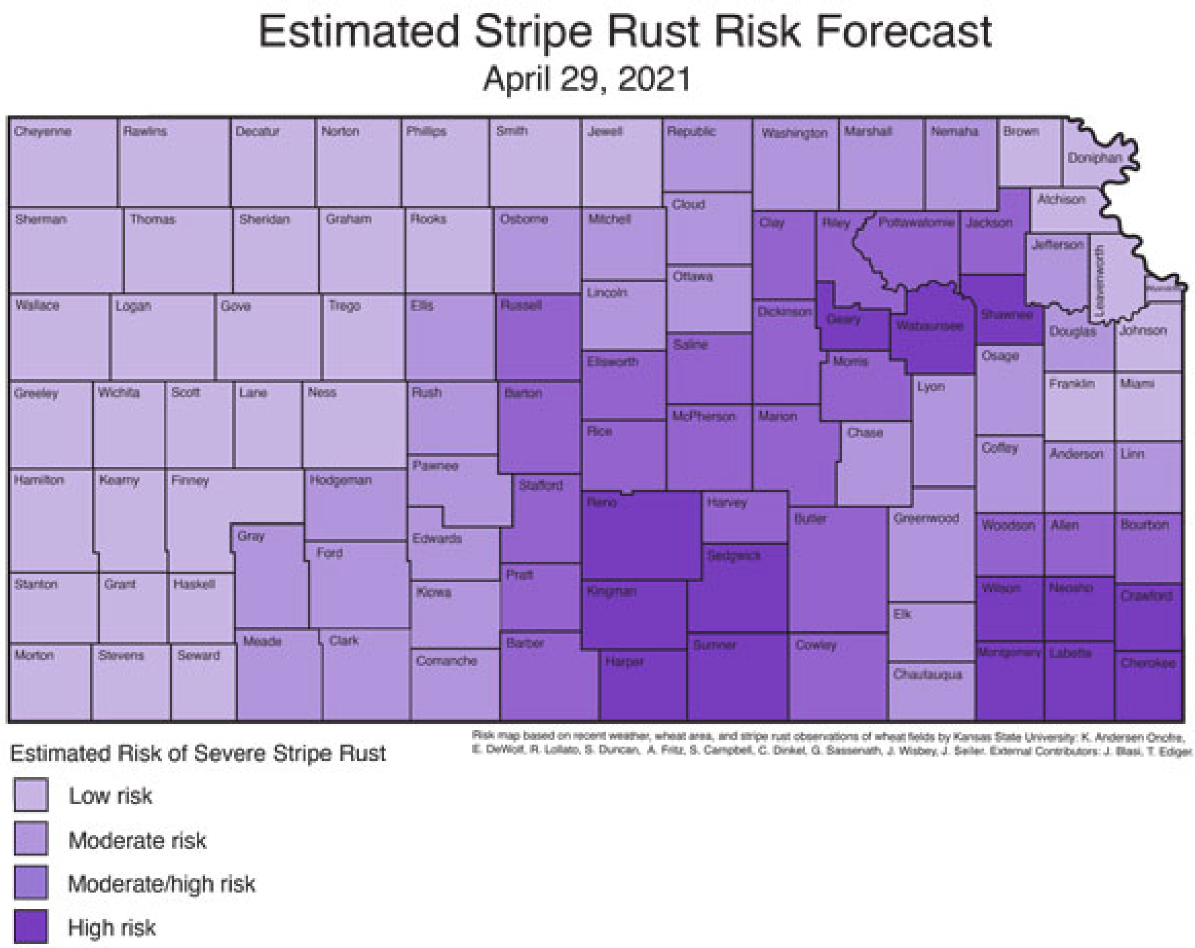

Figure 2. Estimated risk of severe stripe rust as of April 29, 2021. Map takes into account the current wheat growth stage, stripe rust observations, and recent weather conditions. Map created by Kelsey Andersen Onofre, K-State Research and Extension.

Deciding on a fungicide application to control stripe rust

Scouting is a critical first step for stripe rust control. Stripe rust can be identified by characteristic orange lesions that form in straight lines on mature plants (Figure 3). When you run your finger over a stripe rust pustule, the orange spores will be easily dislodged.

Figure 3. Classic symptoms of stripe rust. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Fungicide applications are most beneficial when the level of disease in the field is below 10% severity. University research has demonstrated that applications that protect the fully emerged flag leaf (between Feekes 8 and Feekes 10) are most effective. See this K-State publication for additional information about growth staging wheat: https://bookstore.ksre.ksu.edu/pubs/MF3300.pdf. Applications applied prior to flag leaf emergence will not adequately protect the flag leaf or the head. Always check and follow product label recommendations to ensure full compliance with growth-stage limitations and pre-harvest intervals.

There are many products that are rated very good or excellent for stripe rust control (http://www.bookstore.ksre.ksu.edu/pubs/EP130.pdf), but it is important to know that fungicides in the strobilurin family (Group 11) are not as effective when applied as single product after symptoms have already appeared.

The products listed in the K-State fungicide efficacy publication will generally provide at least 14-21 days of protection. This can vary between products and is also influenced by environmental conditions.

The decision to apply a fungicide should be balanced with the yield potential of the crop and current grain price. Fields with the potential to yield greater than 40 bushels per acre should be prioritized for a fungicide application.

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3. Soybean seeding rates and optimum plant populations

The optimum seeding rate is one of the most influential factors for increasing soybean profitability as seed cost is one of the most expensive inputs. Soybean seeding rate, row spacing, and planting date are all tied together. The final number of seeds per linear foot of row decreases as row spacing narrows. For example, at a target population of 105,000 plants per acre and 85 percent germination, 30-inch rows will need twice the number of seeds per linear foot as 15-inch rows (6 vs. 3 seeds per linear foot). Seeding rate will need to increase at later planting dates to compensate for the reduction in the growing season since more plants are needed to increase early light interception and biomass production.

Seeding rates for high-yielding soybeans: A case study

Information gathered from the Kansas Soybean Yield contest shows that maximum yield (more than 90 bushels per acre) could be achieved with seeding rate ranging from 120,000 to 180,000 seeds per acre (Fig. 1). Note: most of the yields ranged from 60 to 90 bushels per acre.

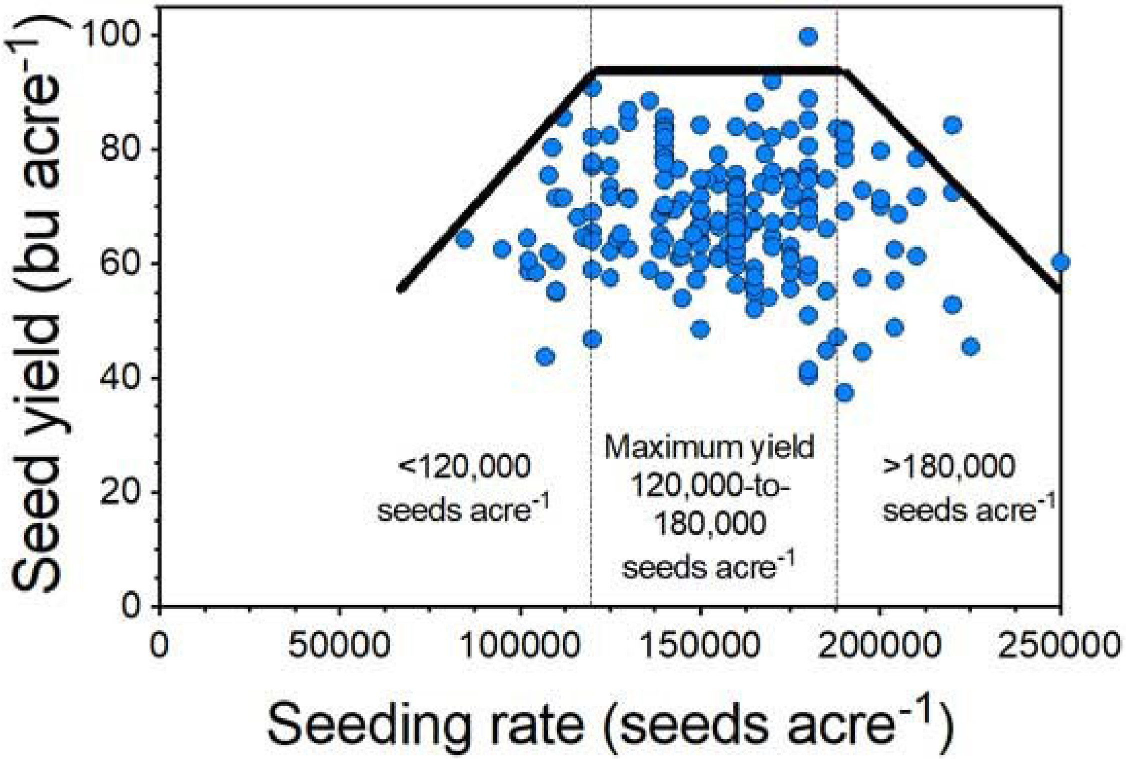

Figure 1. Relationship of soybean yield versus seeding rate for Kansas Soybean Yield Contest data. Graph by Ignacio Ciampitti, K-State Research and Extension.

Yield potential for each environment should be consider when deciding soybean seeding rates. Yield potential is primarily defined by weather conditions (before and after planting), genetic potential, soil type, fertility program, and use of best management practices for producing the crop (proper weed, insect, and disease control from planting until harvest). Before deciding the seeding rates, it is necessary to consider potential soil and weather conditions that could affect the success of the final stand establishment, to achieve the proper plant density required for each yield environment (YE).

Summary of a recent plant density study

Recent economic and productive circumstances have caused interest in within-field variation of the agronomic optimal plant density (minimum number of plants in a per-unit-area basis required to maximize yield) for soybean. A recent study by Carciochi, Ciampitti and collaborators from Corteva published in Agronomy Journal presented a new insight about the optimal plant density by yield environment. For that study, a soybean database evaluating seeding rates ranging from 69,000 to 271,000 seeds per acre was collected, including final number of plants and seed yield. The data was classified in yield environments: **low** (LYE, <59.6 bu per acre), **medium** (MYE, 59.6-64.1 bu per acre), and **high** (HYE, >64.1 bu per acre).

The main outcomes from this study were:

- Optimum plant density decreased by 24% from low (127,000 plants per acre) to high (97,000 plants per acre) yield environments (Fig. 2).
- Optimal density (50% interquantile) ranged between 109,000 - 144,000 plants per acre for the low, from 77,000 to 114,000 plants per acre for the medium, and 76,000 to 117,000 plants per acre for the high yield environment (Fig. 3).
- Greater optimal density for the low yield was not related to a low plant survival rate.
- Less precipitation during the reproductive period was one of the main causes for the need to increase the plant density in low yield environments to overcome a possible reduction in the crop reproductive ability.

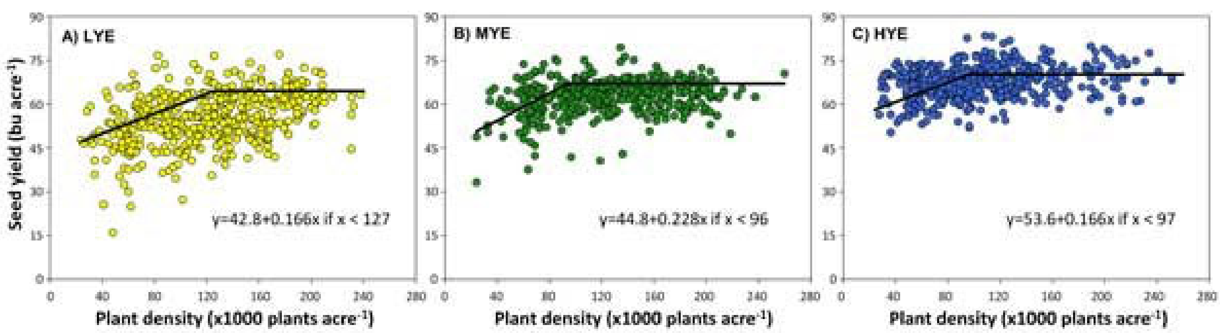

Figure 2. Relationship between seed yield and plant density for low (LYE, <59.6 bushels per acre, A), medium (MYE, 59.6-64.1 bushels per acre, B), and high yield environments (HYE, >64.1 bushels per acre, C). Models were fitted using hierarchical Bayesian models. Graphs by Ignacio Ciampitti, K-State Research and Extension.

This is valuable information for site-specific management strategies, such as variable seeding rate. Thus, within a field, yield variation could be better related to the adjustment of seeding rate for soybeans, improving both the productivity and net return for farmers.

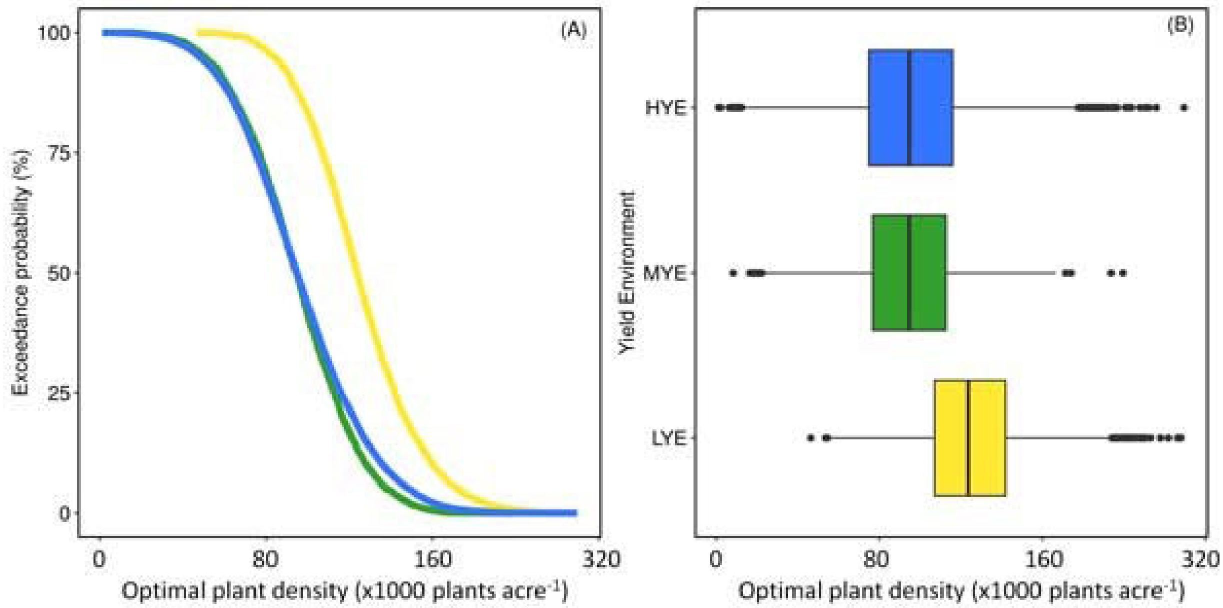

Figure 3. Cumulative probabilities (%) of agronomic optimal plant density (AOPD, plants per acre) (A) and AOPD range to achieve the maximum yield for the seed yield-to-plant density relationship for the low (LYE, in yellow), medium (MYE, in green), and high yield environment (HYE, in blue) (B). For panel B, box plots portray the 25th (bottom edge of the box) and the 75th (top edge of the box). The solid line within the box represents the median and the circles referred to outliers.

In summary, adjusting seeding rates reduces risks of yield losses due to suboptimal densities in a low yield environment, while limiting higher seed costs due to supra-optimal densities, especially for medium and high yield environments. Moreover, soybean plant density levels above the optimal plant density increase the risk of lodging and disease development without adding a yield benefit.

For more information about the optimal soybean seeding rates and optimal plant densities, please consult this new publication from KSRE prepared by Drs. Ciampitti, Carciochi, and Schwalbert:

https://bookstore.ksre.ksu.edu/pubs/MF3460.pdf

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4. Effect of row spacing on soybean yield

There are still many questions about row spacing for soybean production. Research from K-State has found that narrow rows (15-inch or 7.5-inch) result in equal or greater yields compared to 30-inch rows when the yield environment is greater than 45-50 bushels per acre (regardless of planting date, seeding rate, or maturity). Below this yield threshold level, narrow rows tend to result in yields about equal to or slightly below (depending on the water status, the drier the less benefit for narrow rows) yields in 30-inch row spacing. Narrow rows have several benefits such as early canopy cover, better light capture, improved weed control, and reduced erosion. Poor stands, however, are more common with narrow row spacing versus wider row spacing.

For the last seasons, on-farm studies (collaboration between K-State, Kansas Soybean, North Central Soybean Research Program, and the United Soybean Board - USB) showed slight yield improvement (+2 bushels per acre) on narrow rows (15-inch; Figure 1) with yields averaging 48 bushels per acre.

Overall Summary

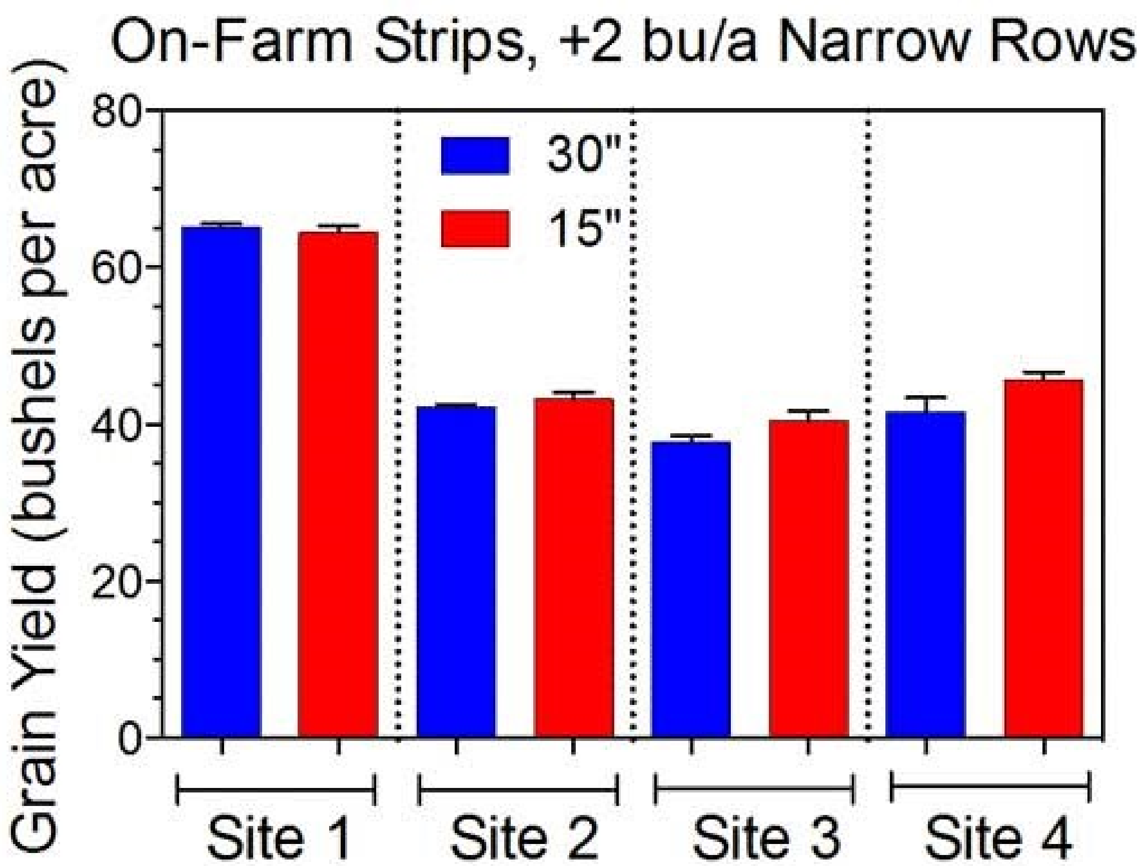
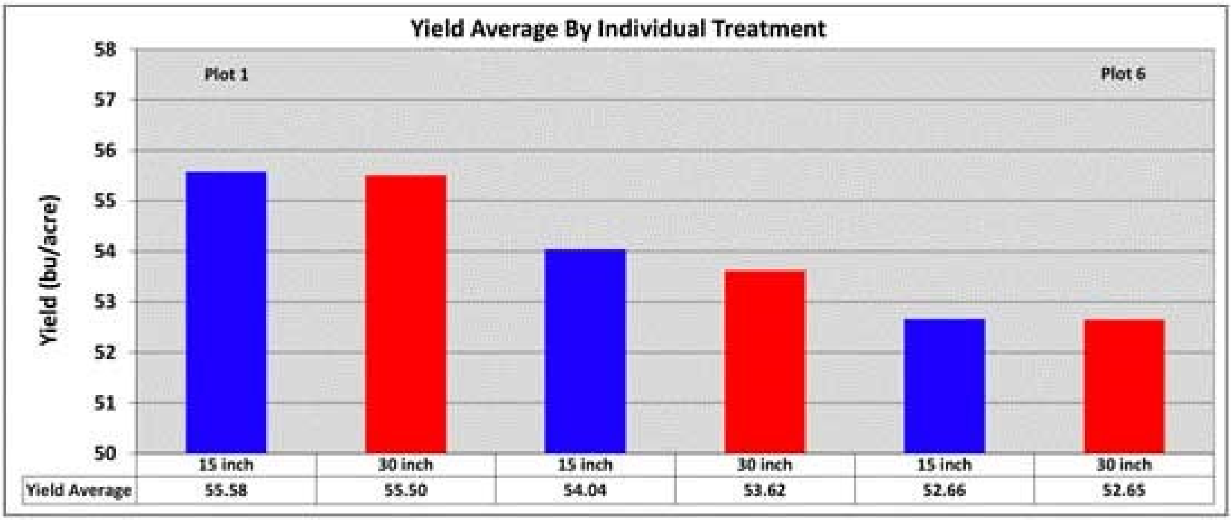


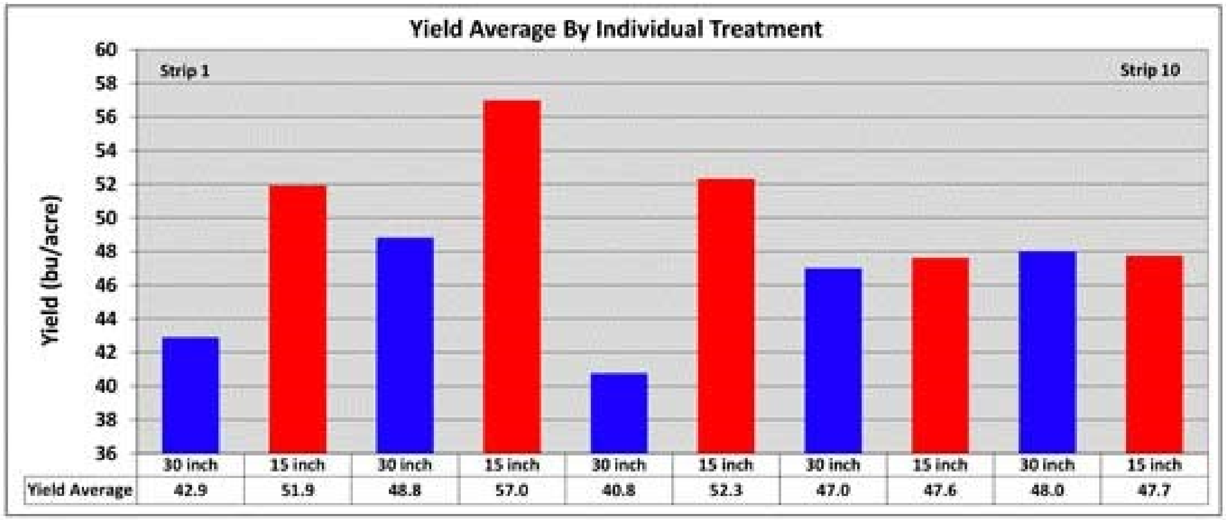
Figure 1. Soybean yield (bushels per acre) by row spacing for conventional (30-inch) versus narrow (15-inch) configuration. Graph by Ignacio Ciampitti, K-State Research and Extension.

For the 2017 season, two studies (collaboration between K-State, Kansas Soybeans, North Central Soybean Research Program) were conducted comparing 15 vs. 30-inch rows. The first study was located in Franklin County, Kansas (Figure 2) and the second one was located in Riley County, Kansas (Figure 3).



Yield Average for All Individual Treatments (bu/acre)	15 inch	30 inch	Yield Difference	A randomization test suggested no evidence of a significant yield difference.
	54.09	53.92	0.17	

Figure 2. Soybean yield (bushels per acre) by row spacing for conventional (30-inch) versus narrow (15-inch) configuration, in Franklin County, Kansas. K-State Research and Extension.



Yield Average for All Individual Treatments (bu/acre)	15 inch	30 inch	Yield Difference	A randomization test suggested some evidence of a significant yield difference.
	51.31	45.50	5.82	

Figure 3. Soybean yield (bushels per acre) by row spacing for conventional (30-inch) versus narrow (15-inch) configuration in Riley County, Kansas. K-State Research and Extension.

Overall, narrow rows provided a yield response ranging from -0.6 to +5.0 bu/acre. An additional benefit for narrow rows was enhanced early light interception and improved weed control.

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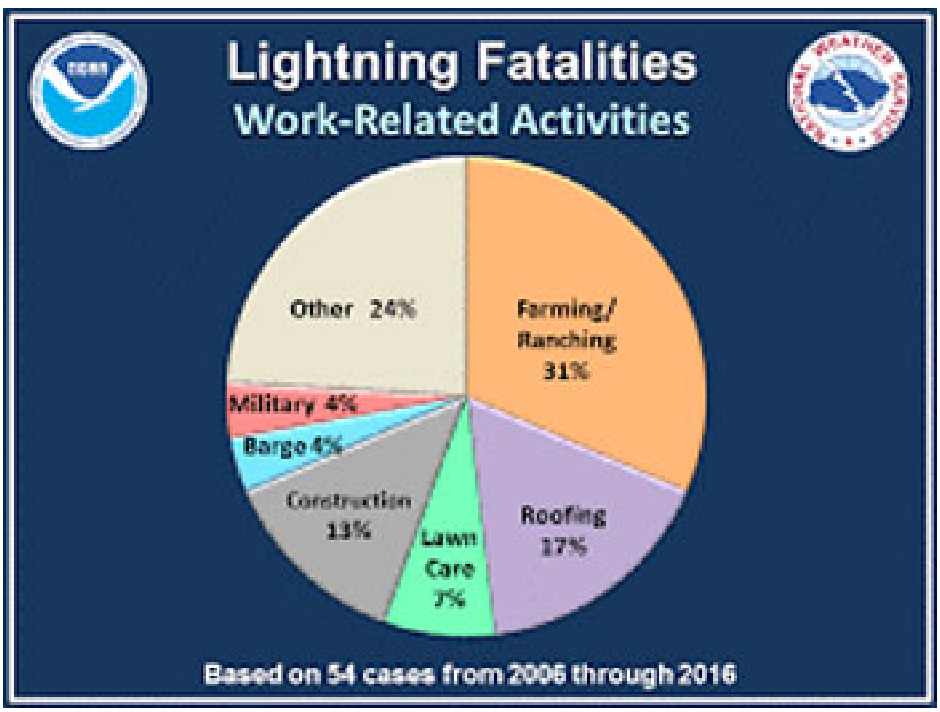
5. Learn the facts about lightning and how to stay safe

As summer thunderstorms develop, it is important to remember one of the major hazards of these storms: lightning. In the United States, 300 people are struck by lightning on average each year. Each spark of lightning can reach over five miles in length, soar to temperatures of approximately 50,000°F, and contain 100 million electrical volts. Thunder is a result of the rapid expansion of heated air. Since light travels faster than sound in the atmosphere, the sound will be heard after the lightning. If you see lightning and hear thunder at the same time, that lightning is in your neighborhood!

The NWS tagline for thunderstorms is "When thunder roars, go indoors". The 'indoors' means a substantial structure with walls, electricity, and plumbing. The electrical and plumbing systems provide a channel to move the electricity of the lightning bolt safely to ground. Open picnic shelters, gazebos, and porches don't provide adequate shelter. When you are indoors, stay away from land-line phones, appliances, and plumbing. All of these can provide a conduit for the electrical charge.

Farmers, ranchers and others who work outdoors are among the most at risk (Figure 1). These occupations often place individuals at some distance from the nearest substantial structure. A fully enclosed metal vehicle, like a truck or a tractor, can provide some protection. The lightning energy is routed through the metal frame to the ground and away from you. Be as careful as possible not to touch anything that might carry the charge.



Metal buildings provide another dilemma – it might appear to be safe but actually might not provide much protection. If there are large openings, it is unlikely to provide sufficient structure to be a safe haven. Also, be cautious of concrete floors which likely have metal rebar as reinforcement that can also carry a charge and put you at risk. These metal reinforcements can also be a problem with concrete walls. It's really tempting to do indoor work during a thunderstorm. Remember, you do not want to use power tools, desktop computers, or anything plugged into the wall.

Additional precautions:

- Avoid open fields, the top of a hill, or a ridge top.
- Stay away from metal fencing. Electricity can travel miles along barbed wire (Figure 2).
- Stay away from tall, isolated trees or other tall objects. If you are in a forest, stay near a lower stand of trees.
- If you are in a group, spread out to avoid the current traveling between group members.
- Stay away from water and wet items such as ropes and hoses.

Water and metal do not attract lightning but they are excellent conductors of electricity. The current from a lightning flash will easily travel for long distances.

Figure 2. Cattle killed by lightning. Photo: Ruth Lyon-Bateman.

For more information on lightning safety, check out these resources:

https://www.weather.gov/media/owlie/Lightning-Brochure18.pdf

https://www.weather.gov/media/owlie/OSHA_FS-3863_Lightning_Safety_05-2016.pdf https://scijinks.gov/lightning-detection/

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6. Virtual crop scouting school now available

The 2021 Virtual Crop Scout School is now available and is free to the general public. The scout school consists of 22 webinars from crop protection specialists at eleven Midwest Universities and is offered through the Crop Protection Network (CPN).

Crop scouts, farmers, and other users can pick and choose from a variety of diverse subjects to help them become more knowledgeable on crop scouting. Topics are split into digestible bits so crop scouts can interact with subject matter in a way that best suits their time and interest.

Two K-State specialists contributed webinars related to their respective specialty. These webinars are listed below with a short summary about their topic.

Sarah Lancaster, Weed Science Extension Specialist: Grass seedlings appear similar to one another while standing up, but get closer to them and you'll be able to see that there are many different species common in crop and forage fields. In this webinar, she explains how to differentiate between common grasses utilizing characteristics such as habitat and growth habit, as well as plant parts such as auricles, collars and ligules. Grass flowers can also be used to identify weed species.

Rodrigo Onofre, Plant Pathology Postdoctoral Fellow: Identifying corn diseases in the field can be difficult and some diseases require sending samples to a lab for confirmation. In this webinar, he will share the information crop scouts should gather before heading to the field, as well as resources that help scouts gather information before arriving at the field. He will also explain common signs and symptoms of diseases, where they show up on a plant and what conditions favor disease development. Many disorders and diseases are easily confused for one another.

Crop scouting in an important part of integrated pest management (IPM) that can help farmers obtain higher yields and increased profit per acre. Scouting gives farmers and agronomists a "heads-up" about what is happening in the field, allowing preemptive action and appropriate management decisions to be applied. The field scout gathers information on the crop condition of a field, which can help in discerning which of the various management tools to use (Figure 1).

Figure 1. Scouting crop fields on a regular basis can help to determine emerging crop problems and helps to inform management decisions. Image by Brandon Kleinke.

Interested individuals can access the crop scout school at: https://cropprotectionnetwork.org/virtual-crop-scout-school

Additional resources and CEU credits

Earlier this year, the CPN released a free web book on crop scouting – Crop Scouting Basics for Corn and Soybean. This resource is available for online and is a valuable complement to the 2021 Virtual

Crop Scout School.

After reading CPN publications and watching virtual webinars, like the web book and Virtual Crop Scouting School, Certified Crop Advisors can complete the corresponding quizzes to earn continuing education credits (CEUs). More information on this process is found at: https://ceu.cropprotectionnetwork.org/

CPN has partnered with Universities all over the Midwest to make these webinars a reality. This work is/was supported by the USDA National Institute of Food and Agriculture, Crop Protection and Pest Management Program through the North Central IPM Center (2018-70006-28883).

CPN is a multi-state and international partnership of university and provincial Extension specialists, and public and private professionals that provides unbiased, research-based information. CPN's goal is to communicate relevant information to farmers and agricultural personnel to help with decisions related to protecting field crops

For more information, please contact cropprotectionnetwork@gmail.com