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eUpdate

08/28/2020

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. In-furrow fertilizers for wheat

Wheat is considered a highly responsive crop to band-applied fertilizers, particularly phosphorus (P). Application of P as starter fertilizer can be an effective method for part or all the P needs. Wheat plants typically show a significant increase in fall tillers (Figure 1) and better root development with the use of starter fertilizer (P and N). Winterkill can also be reduced with the use of starter fertilizers, particularly in low P testing soils.

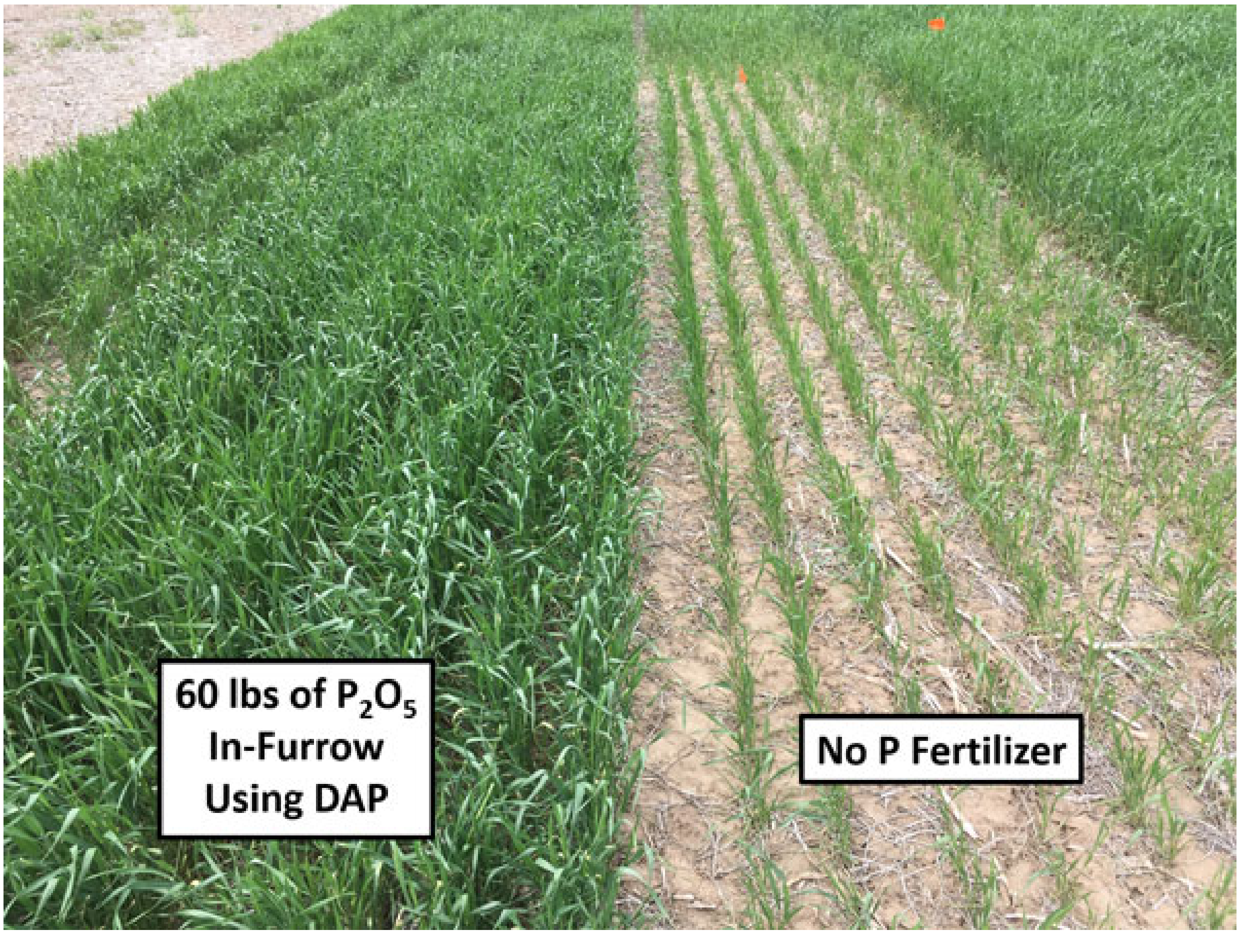

Figure 1. Effects on wheat tillering and early growth with in-furrow P fertilizer on soil testing low in P. Photo taken in 2020 in Manhattan, KS. Photo by Chris Weber, K-State Research and Extension.

In-furrow fertilizer application

Phosphorus fertilizer application can be done through the drill with the seed. In-furrow fertilizer can be applied, depending on the soil test and recommended application rate, either in addition to or instead of, any pre-plant P applications. The use of dry fertilizer sources with air seeders is a very popular and practical option. However, other P sources (including liquid) are agronomically equivalent and decisions should be based on cost and adaptability for each operation.

When applying fertilizer with the seed, rates should be limited to avoid potential toxicity to the seedling. When placing fertilizer in direct contact with wheat seed, producers should use the guidelines in Table 1.

Table 1. Suggested maximum rates of fertilizer to apply directly with the wheat seed

	Pounds N + K_2O (No urea containing fertilizers)	
Row spacing (inches)	Medium-to-fine soil textures	Course textures or dry soils
15	16	11
10	24	17
6-8	30	21

Air seeders that place the starter fertilizer and seed in a 1- to 2-inch band, rather than a narrow seed slot, provide some margin of safety because the concentration of the fertilizer and seed is lower in these diffuse bands. In this scenario, adding a little extra N fertilizer to the starter is less likely to injure the seed - but it is still a risk.

What about blending dry 18-46-0 (DAP) or 11-52-0 (MAP) directly with the seed in the hopper? Will the N in these products hurt the seed?

The N in these fertilizer products is in the ammonium-N form (NH_4^+), not the urea-N form, and is much less likely to injure the wheat seed, even though it is in direct seed contact. As for rates, guidelines provided in the table above should be used. If DAP or MAP is mixed with the seed, the mixture can safely be left in the seed hopper overnight without injuring the seed or gumming up the works. However, it is important to keep the wheat mixed with MAP or DAP in a lower relative humidity. A humidity greater than 70% will result in the fertilizer taking up moisture and will cause gumming or caking within the mixture.

How long can you allow this mixture of seed and fertilizer to set together without seeing any negative effects to crop establishment and yield?

The effects of leaving DAP fertilizer left mixed with wheat seed for various amounts of time is shown in Figure 2. Little to no negative effect was observed (up to 12 days in the K-State study) as long as the mixture is stored at a relative humidity less than 70%.

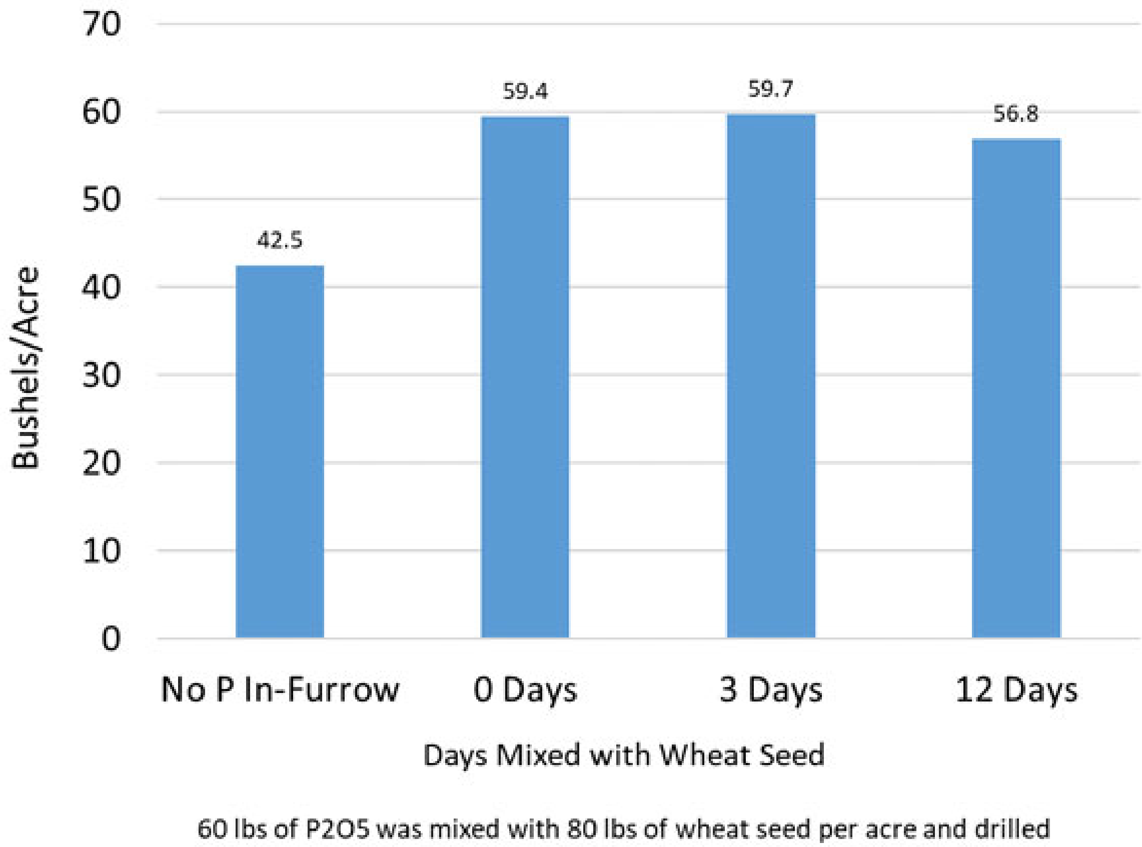

Figure 2. Effects on wheat yield from mixing P fertilizer with the seed. Study conducted in 2019 and 2020 at sites in Manhattan, Rossville, and Topeka. Graph by Chris Weber, K-State Research and Extension.

Although the wheat response to these in-furrow fertilizer products is primarily from the P, the small amount of N that is present in DAP, MAP, or 10-34-0 may also be important in some cases. If no pre-plant N was applied, and the soil has little or no carryover N from the previous crop, the N from these fertilizer products could benefit the wheat.

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2. Cover crop response to herbicides

As we approach September, some producers are thinking about seeding winter cover crops in fields currently planted to corn. The successful establishment of winter cover crops is influenced by several factors that are discussed in a previous eUpdate (*New cover crop factsheet discusses planting cereal rye after corn harvest ahead of soybean* - https://bookstore.ksre.ksu.edu/pubs/MF3504.pdf). This article will provide some additional details about cover crop responses to various herbicides.

Cover crop response to herbicides will be influenced by a number of factors, including biological and biochemical characteristics of the plant, chemical characteristics of the herbicide, and weather conditions since herbicide application. Table 1 summarizes the response of selected cover crops to selected herbicides. For simplicity, no herbicide premixes are included in the list. Recommendations are conservative estimates based on published field research and herbicide labels.

Table 1. Likelihood of injury to selected cover crops when planted in the fall after a spring application of selected corn herbicides. Green = injury unlikely; Yellow = injury possible; Red = injury likely; white = sufficient data not available.

Herbicide	Cereal rye	Wheat	Red clover	Hairy vetch	Radish
Atrazine	Green	Green	Yellow	Yellow	Yellow
Balance Flexx, (isoxafluotle)	Yellow	Yellow	Yellow		Red
Callisto (mesotrione)	Green	Yellow	Red	Yellow	Yellow
Dual II Magnum (S-metolachlor)	Green	Yellow	Green	Green	Green
Harness (acetochlor)	Green	Yellow	Yellow	Green	Green
Outlook (dimethenamid-P)			Yellow		Yellow
Prowl H20 (pendimethalin)	Yellow	Yellow	Red	Yellow	
Sharpen (saflufenacil)	Green	Green	Yellow		Red
Valor (flumioxazin)	Yellow	Yellow	Yellow	Yellow	Green
Zidua (pyrasulfoxone)	Green	Yellow	Yellow	Green	Yellow

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 and update use requirements.

References

Brooker, et al., 2020; Cornelius and Bradley, 2017; Palhano, et al., 2018; Price, et al., 2020; Rector, et al., 2020; Wallace, et al., 2017

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

As the growing season wraps up, producers have an opportunity to improve their water productivity by properly timing their final irrigation application. This is an important decision as an early termination of irrigation can result in reductions in grain yield, primarily through reductions in the kernel weight yield component. Conversely, a late termination of irrigation results in unnecessary pumping, energy consumption, and increasing the risk of soil compaction at harvest due to increased soil water and the risk of water loss through drainage.

With the goal of matching available water to crop needs while avoiding excess, it is important to understand crop water use requirements late in the growing season. Anticipated water use from various growth stages until physiological maturity for corn, grain sorghum, and soybeans is shown in Table 1.

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

Stage of Growth	Approximate number of days to maturity	Water use to maturity (inches)
Corn		
Blister	45	10.5
Dough	34	7.5
Beginning dent	24	5
Full dent	13	2.5
Black layer	0	0
Grain Sorghum		
Mid bloom	34	9
Soft dough	23	5
Hard dough	12	2
Black layer	0	0
Soybeans		
Full pod	37	9
Beginning seed	29	6.5
Full seed	17	3.5
Full maturity	0	0

Adapted from K-State MF2174, Rogers and Sothers.

Research in western Kansas has shown the importance of keeping the management allowable depletion limited to 45% during the post-tassel period. In other words, 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 add just enough irrigation water to meet that demand and maintain profile available soil water content above 55%.

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

Termination Based on Calendar Dates

Traditionally many producers have used a fixed calendar date to determine their final irrigation. Long-term studies conducted 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. Over the course of this study, the irrigation termination date for maximum grain yield varied from August 12 to September 21. This is a significant departure from a general rule of thumb using Labor Day as a termination date. As shown, the use of 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 soil profiles 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.

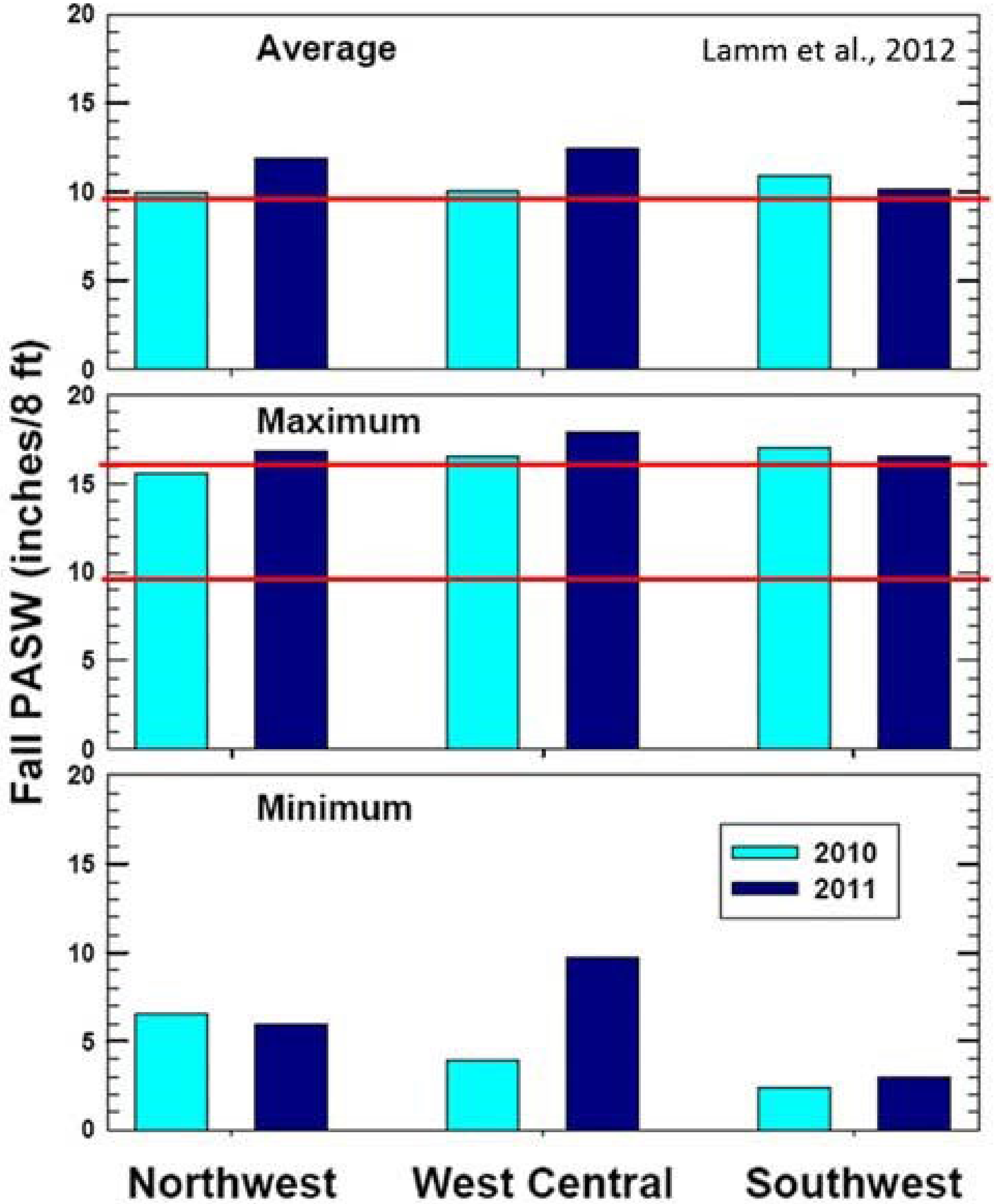

Figure 1. Results from 2-year survey of irrigated corn fields. Fields were surveyed after harvest across three east-west transects in western KS.

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, are 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 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 publication MF2174: "Predicting the final irrigation for corn, grain sorghum, and soybeans"; http://www.bookstore.ksre.ksu.edu/pubs/MF2174.pdf

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4. Understanding soybean seed filling: Contribution to yield

The latest USDA-National Agricultural Statistics Service, Kansas Crop Progress and Condition report classified 67% of the soybean crop to be in good to excellent condition. Overall, only 4% of all soybeans in Kansas are dropping leaves with most of the crop entering into the "seed-filling" period.

The weather conditions expected in the next coming weeks will be critical for soybeans (mostly for early-planted crops) to define not only the final attainable seed weight, but also the final number of pods and seeds per pods (or seeds per unit area). The 8 to14-day weather outlook from NOAA indicates a normal to slightly above-normal probability for precipitation in the central and eastern parts of Kansas, but a below normal probability for the western region, potentially shortening the seed filling duration due to stress conditions. There is still quite a bit of yield to be defined in the next month of growth for soybeans. Relative to the final total yield (biomass) at harvest, soybeans only accumulate 60-70% until R5 stage, **with the other 30-40% accumulated during the seed filling (R5-R7), lasting 30-40 days** (see Figure 1, initial seed filling around 1000 °C d).

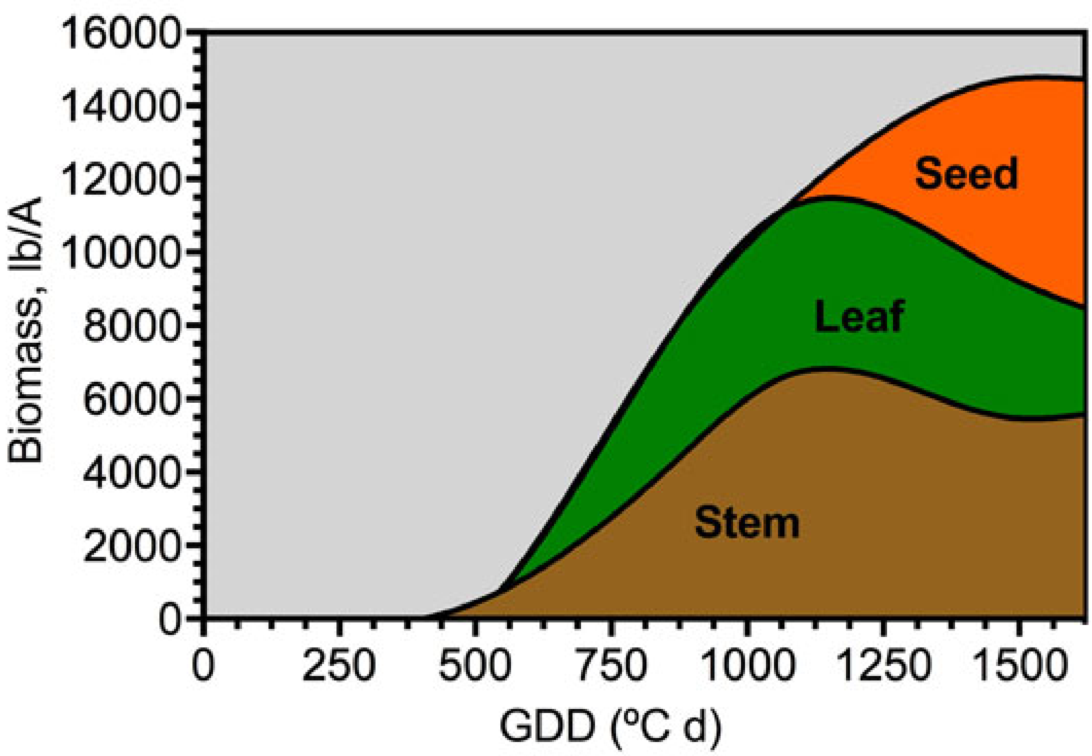

Figure 1. Soybean biomass accumulation from planting to maturity, seed filling period from 1000 °C d to maturity. Figure prepared by Ignacio Ciampitti and Guillermo Balboa, K-State Research and Extension.

Soybean dry matter accumulation and water changes during seed-filling

Soybeans will reach final maturity with high seed water content, moving from 75-80% (R6) to around 50% (R7) from beginning of seed filling until final maturity (Figure 2). Final maturity is defined as the formation of the black layer in the seeds. The process of seed dry matter accumulation and moisture changes will depend on the maturity group (affecting the length of the season), planting date, and weather conditions experienced during the latter part of the reproductive phase.

Changes in the water content during the seed-filling process (Figure 2) were previously described in our "Soybean Growth and Development" poster. As described for corn, seed water loss for soybeans can also divided in two phases: 1) before "black layer" or maturity, and 2) after black layer.

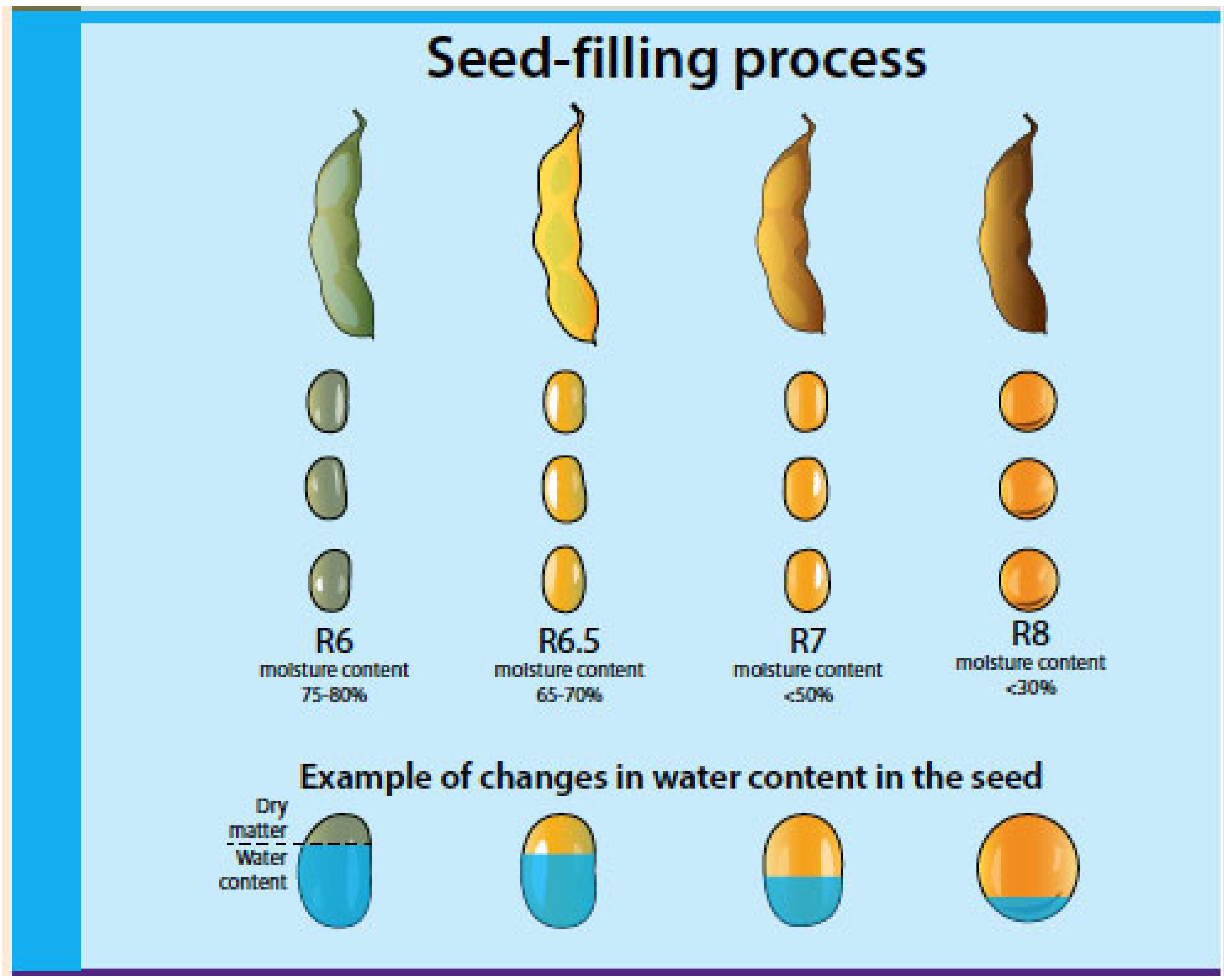

Figure 2. Soybean seed filling process from full seed to full maturity. Photo and infographic prepared by Ignacio Ciampitti, K-State Research and Extension. Taken from Soybean Growth and Development.

The overall contribution of seed weight to final yield can be studied by evaluating changes in seed weight during the seed filling period, building a dataset portraying the rate and duration of the changes in seed filling (Figure 3).

In the example presented below, overall seed filling lasted more than one month (37 days) until black layer (no changes in seed weight) was achieved. The graph of seed filling provides a visual of the overall rate, increase in seed weight per day, and the duration of the seed filling (Figure 3). With this information, we can improve our understanding of potential impacts of stress conditions during this time of the season for soybeans. In the example presented in Figure 3, you can see the impact that decreasing the effective duration of the seed filling period has in the final yield. When the duration is reduced by one week (from 37 to 30 days), the attainable yield dropped from 61 to roughly 50 bushels per acre.

Potential impacts on leaf green area imposed by insects, diseases, hailstorms, and any other potential abiotic stress conditions (extremely high temperature, cloudy days, lack of timely precipitation, and early frost) impacting the crop during the coming weeks will negatively affect the seed filling conditions for soybeans.

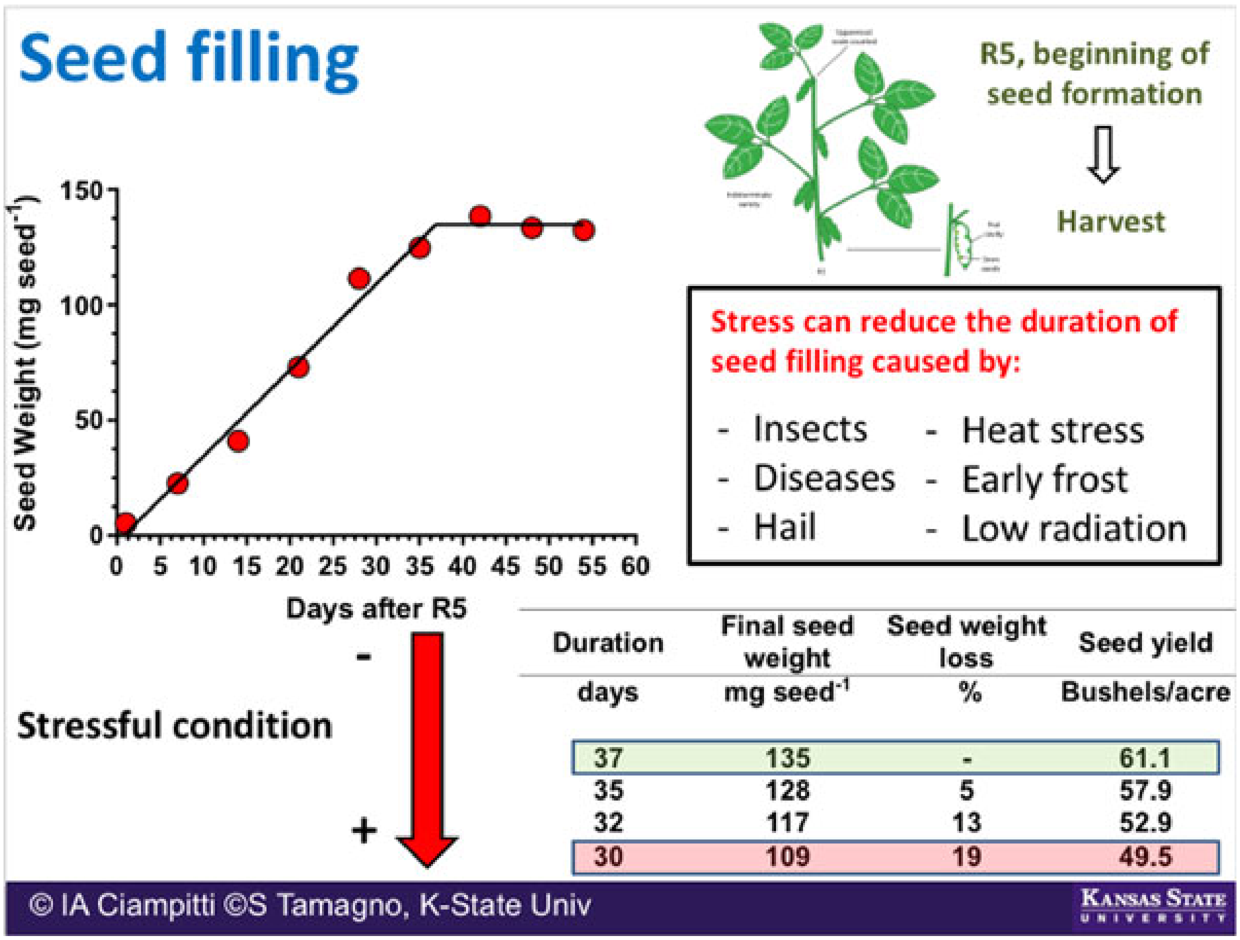

Figure 3. Soybean seed weight changes from beginning of seed filling (R5) to full maturity. Photo and infographic prepared by Ignacio Ciampitti and Santiago Tamagno, K-State Research and Extension.

In summary, much of the yield for the Kansas soybean crop is still to be determined in the coming weeks. Scout your fields for any potential issues impacting overall plant health to maximize the chances of maintaining yields.

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5. Reports of sugarcane aphid on grain sorghum in Kansas

The sugarcane aphid has now been reported in several counties in Kansas as seen below in the map highlighted in green (Figure 1). Grain sorghum producers in Kansas should continue scouting their fields on a routine basis.

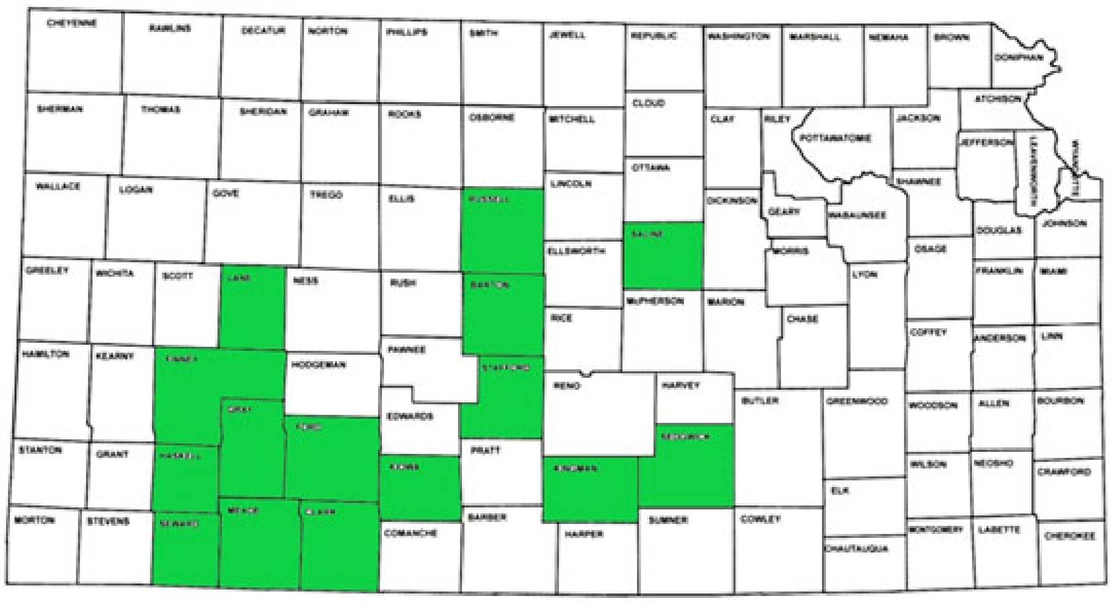

Figure 1. Current status of the SCA. The map indicates only the counties in which the SCA has been found and does not indicate how many or how few aphids were found in that county. Source: https://www.myfields.info/pests/sugarcane-aphid

There have been several reports of declining corn leaf aphid populations and an increase in sugarcane aphid (SCA) populations this week in sorghum fields (Figure 2). Corn leaf aphids can be very profuse and produce lots of honey dew, however they can be beneficial to have around as they bring in LOTS of predators (Figure 3)!! Corn leaf aphids rarely need to be sprayed in sorghum and keep the predators around to take care of those pesky SCA. Parasitoids are still having trouble laying eggs inside some populations of SCA, but other predators are picking SCA off.

Figure 2. LEFT: corn leaf aphids on sorghum, RIGHT: sugarcane aphids in sorghum. Photos by K-State Research and Extension.

Figure 3. LEFT: corn leaf aphids will often infest the sorghum whorl and the emerging sorghum head, RIGHT: sugarcane aphids prefer to infest the leaves of the sorghum plant but eventually may move into the head later in the season. Photos by K-State Research and Extension.

Scouting time for SCA

Early detection is key to the management of this pest, but treatments should be based on established thresholds. One heavily infested plant does not equal a yield loss. Applying insecticides too soon can result in repeated applications.

Plants are vulnerable to infestation by SCA at any growth stage, but Kansas sorghum is most at risk from boot stage onward. The ability of sugarcane aphid to overwinter on Johnsongrass and re-sprouting sorghum stubble represents challenges to the management of this pest in more southerly regions.

Issues arising from SCA in Kansas are likely to become increasingly uncommon with each passing year. However, there is a good amount of late-planted sorghum this year that is going to be more at risk going into late summer. Producers would be wise to scout these late-planted fields.

Sampling method

- Once a week, walk 25 feet into the field and examine plants along 50 feet of row:
- If honeydew is present, look for SCA on the underside of a leaf above the honeydew.
- Inspect the underside of leaves from the upper and lower canopy from 15–20 plants per

location.
- Sample each side of the field as well as sites near Johnsongrass and tall mutant plants.
- Check at least 4 locations per field for a total 4 locations per field for a total of 60-80 plants.

If no SCA are present, or only a few wingless/winged aphids are on upper leaves, repeat this sampling method once a week thereafter.

If SCA are found on lower or mid-canopy leaves, begin twice-a-week scouting. Use the same sampling method, but be sure to include % plants with honeydew. Estimate the % of infested plants with large amounts of SCA honeydew (shiny, sticky substance on leaf surface) to help time foliar insecticides for SCA control on sorghum (Table 1).

Table 1. SCA Thresholds

Growth Stage	**Threshold**
Pre-Boot	20% plants infested with localized area of heavy honeydew and established aphid colonies
Boot	20% plants infested with localized area of heavy honeydew and established aphid colonies
Soft dough	30% plants infested with localized area of heavy honeydew and established aphid colonies
Dough	30% plants infested with localized area of heavy honeydew and established aphid colonies
Black Layer	Heavy honeydew and established aphid colonies in head *only treat to prevent harvest problems **observe pre-harvest intervals

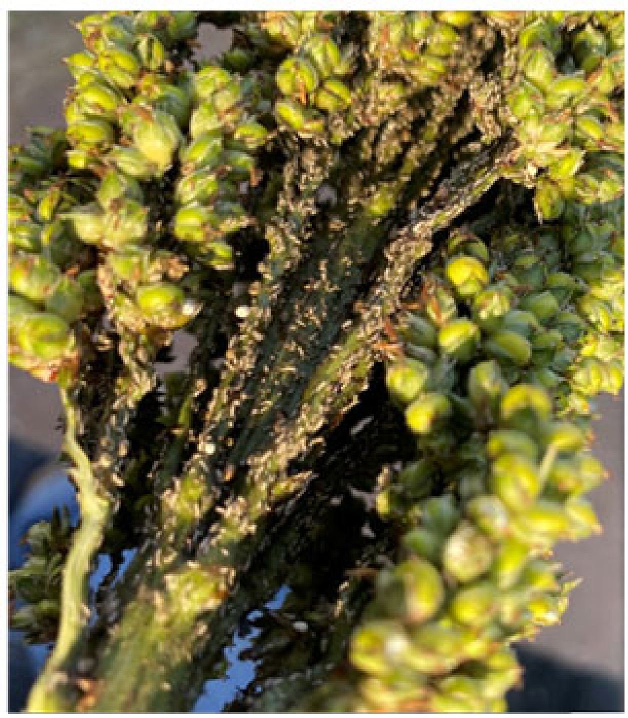

Figure 4. LEFT: Evidence of sugarcane aphids including their shed skins and their honey dew, RIGHT: evidence of corn leaf aphids including old honey dew and shed skins. Photos by K-State Research and Extension.

For ongoing current information on SCA in Kansas, check out the myFields web site often in the coming weeks and months: https://www.myfields.info/pests/sugarcane-aphid

Please email R. Max Dunlap (xammax@ksu.edu) with counties to add to the map!!

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6. World of Weeds: Hophornbeam copperleaf

Hophornbeam copperleaf has a funny name, but it can be a serious problem – especially if residual herbicides are not used. In this month's World of Weeds article, will discuss more about this plant, which is also called three-seeded mercury.

Ecology of hophornbeam copperleaf

Hophornbeam copperleaf (*Acalypha ostryifolia*) is a summer annual and is native to North America. It is found throughout much of Kansas, but is most common in the southeastern part of the state. It is often found in moist areas with full to partial sun. It is well adapted to no-till production systems, but can be found in conventionally-tilled fields as well. In experiments conducted in Topeka and Junction City, KS, Horak et al. reported that each hophornbeam copperleaf plant can produce over 12,500 seeds. The same paper reported that seeds germinate best at about 86°F and can germinate throughout the growing season.

Identification

Hophornbeam copperleaf has a hairy stem that can grow up to approximately four feet tall. Even though it is classified in the spurge family, it does not produce milky sap when the stems are broken. The round cotyledons could be mistaken for prickly sida and are covered in hairs. The first leaves are opposite (Figure 1), but later leaves are alternately arranged along the stem and are somewhat heart-shaped at the base with serrated margins. Male and female flowers are found on the same plant, but in separate locations. Male flowers are found at the base of branches, while female flowers are found at the end of stem (Figure 2).

Figure 1. Hophornbeam copperleaf seedling with opposite leaves. Photo by Sarah Lancaster, K-State Research and Extension.

Figure 2. Mature hophornbeam copperleaf. Notice the serrated leaf margins and the seedhead at the top of the plant. Photo by Sarah Lancaster, K-State Research and Extension.

Management

Hophornbeam copperleaf germinates best in warm soils, so it may emerge after herbicides have been applied. Because of this, residual herbicides such as atrazine, metribuzin, Dual Magnum, Spartan, or Valor are important for control. Horak et al. reported that post-emergence applications of Cobra and Reflex can effectively control hophornbeam copperleaf, but Resource, 2,4-D and Group 2 herbicides (Classic, Harmony, Pursuit, and Raptor) did not provide control. Others have reported that hophornbeam copperleaf can be controlled with post-emergence applications of Liberty, but is not well controlled by glyphosate or dicamba.

What weed species will be featured next month? Stay tuned to the Agronomy eUpdate to find out!

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