Issue 820

K-STATE Research and Extension

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eUpdate

09/25/2020

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. Soybean dry down rate before harvest

The latest USDA-National Agricultural Statistics Service crop progress and condition report released September 21 classified 45% of the soybean crop to be in good or excellent condition. Overall, 48% of all soybeans in Kansas are dropping leaves, well ahead of 23% last year and a five-year average of 34%.

Weather outlook

The weather conditions expected for October will be critical for soybeans as related to seed filling and determining final seed weight.

Current conditions have been cooler-than-average and temperatures are expected to continue to trend cooler than normal during the next 8- to 14-day period. The current October outlook does suggest an increased chance for warmer-than-normal conditions to return for the rest of the month. Drying may still take a significant amount of time, as typical October temperatures are much cooler than September. There is a strong chance for drier-than-normal conditions for both the short term (6-10 days), and October as a whole. Keep in mind that there is a significant drop in normal rainfall amounts from September to October as we move into a typically drier part of the year.

Soybean dry down

Soybeans will reach final maturity with high seed water content, moving from 90% to around 60% from beginning of seed filling until final maturity. Final maturity is defined as the formation of the black layer in the seeds. The dry down rate 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 1) 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. For understanding the changes in water content before "black layer", visit the previous article in Issue 816 (August 28, 2020) related to the contribution of seed filling to yield: https://bit.ly/3jpq5Wu

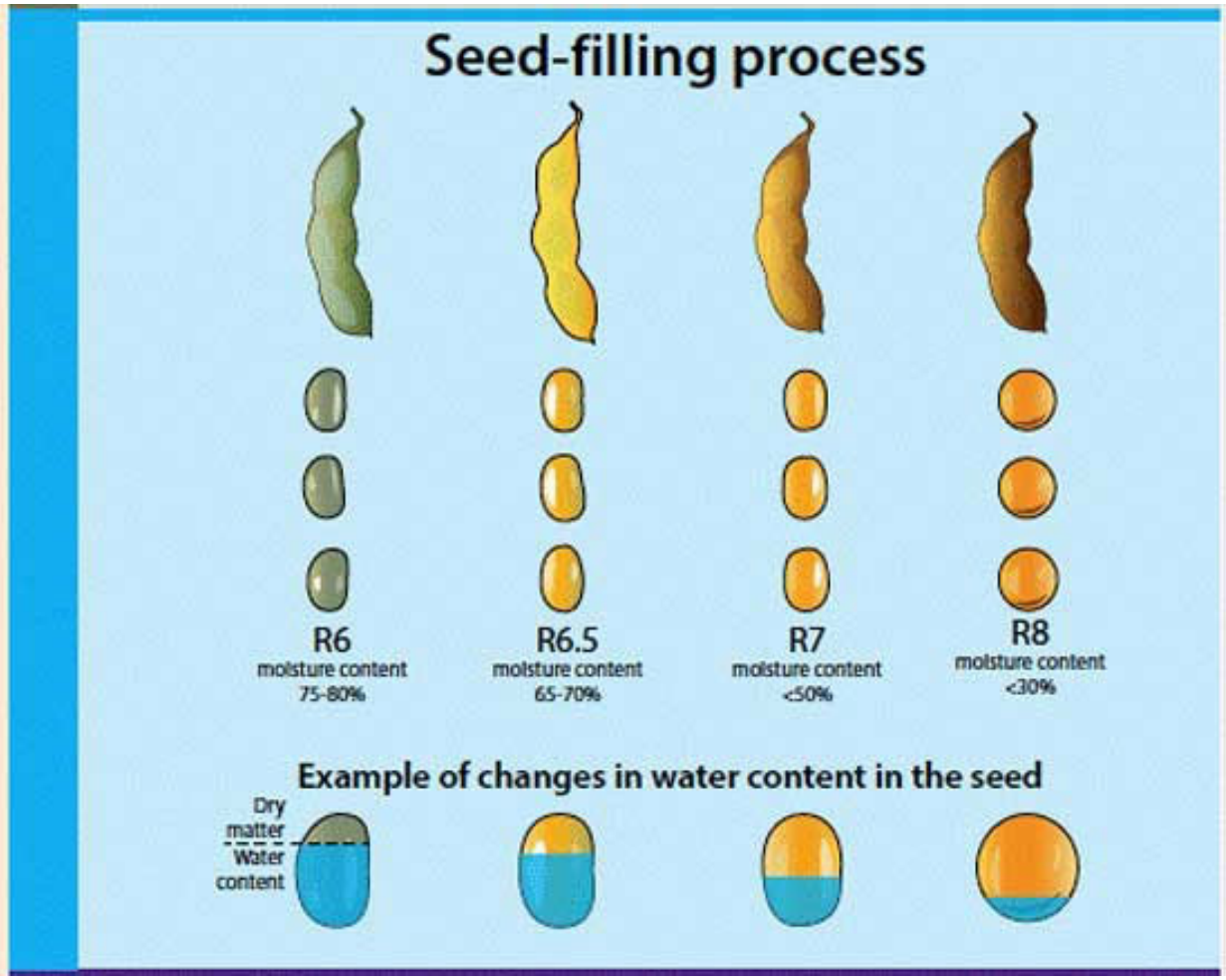

Figure 1. Soybean seed filling process from full seed to full maturity. Photo and infographic prepared by Ignacio Ciampitti, K-State Research and Extension. Taken from Soybean Growth and Development, MF3339.

To address the question related to the dry down rate for soybeans, a study was conducted to investigate the changes in water content from black layer formation (maturity) until harvest time (Figure 2). During the last days of September and mid-October 2016, the overall dry down rate was around 3% per day (from 58% to 12% seed moisture) – taking an overall period of 15 days.

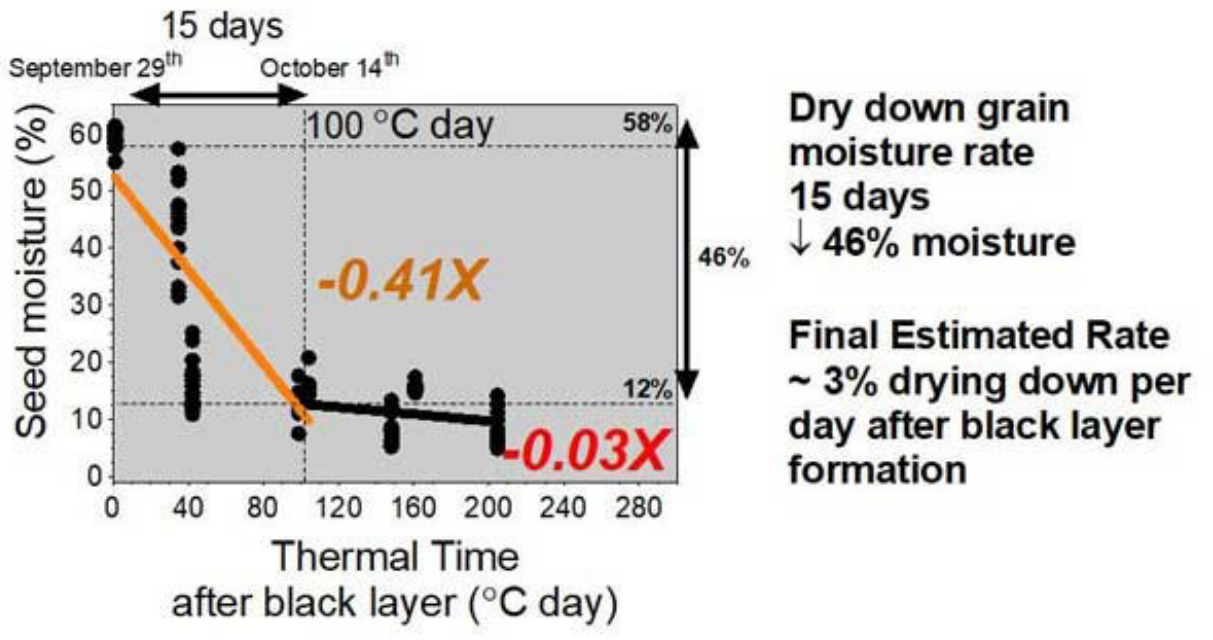

Figure 2. Grain moisture dry down (orange line) across three hybrids and different N rates near Manhattan, KS. Horizontal dashed lines marked the 58% seed moisture at black layer formation. * Graph prepared by Ignacio Ciampitti, K-State Research and Extension.

**Note: It is desired to reach harvest with 13% seed moisture to maximize the final seed volume to be sold, thus the importance of timing harvest with the right seed moisture content.*

Soybean dry down rate was three-time faster, 3% per day, relative to corn at 1% per day. These dry down rates for corn and soybeans are primarily affected by temperature, humidity, and overall water content at the point of black layer formation (maturity). These main factors should be considered when the time comes to schedule soybean harvest.

For more information on dry down rates for corn, see the eUpdate article, "Rate of dry down in corn before harvest", in the September 4, 2020 issue.

Ignacio A. Ciampitti, Crop Production and Cropping Systems Specialist
ciampitti@ksu.edu

Mary Knapp, Weather Data Library
mknapp@ksu.edu

2. Sorghum development and potential freeze injury

The latest USDA-NASS Crop Progress and Condition report for Kansas released September 21 stated that grain sorghum maturity was at 32%, ahead of 18% for last year, and close to the five-year average of 28%. Almost 60% of the crop was rated as good or excellent condition. The extremely cold temperatures of early September likely impacted crop development.

Will the remaining sorghum reach maturity before first freeze? The answer is, it depends. There are two main factors involved:

1) weather conditions and how they affected the development of sorghum during the season, and

2) crop phenology -- when the crop was planted, hybrid maturity, and the date of half-bloom.

Further details on sorghum growth and development can be found at:
https://www.bookstore.ksre.ksu.edu/pubs/MF3234.pdf

Weather component

During August, there was a split in the temperature pattern. The south central saw cooler-than-normal temperatures with the greatest departure at 2 to 4 degrees below normal. The warmest conditions were in the western divisions. Departures in the northwest were at 1 to 2 degrees above normal temperatures (Figure 1, upper panel). During September, departures from normal ranged from -7 to +1 degrees. (Figure 1, lower panel).

A delay in flowering time could jeopardize yields if the crop is exposed to heat. Recent K-State research published by Prasad, Djanaguiraman, Perumal, and Ciampitti found that high temperature stress around flowering time (5-days before and after flowering) could impact final grain number.

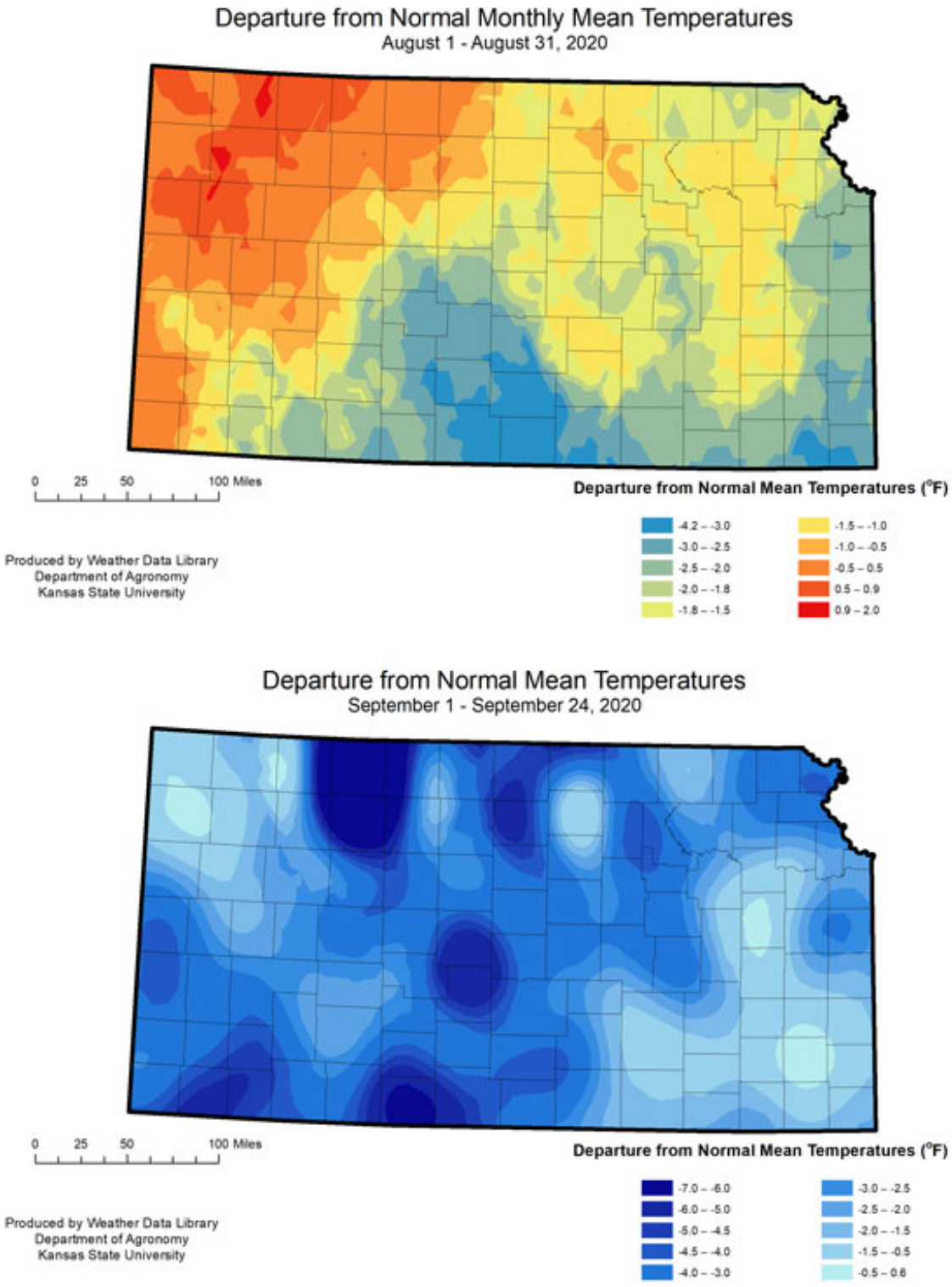

Figure 1. Departure from monthly mean temperature for the August 2020 (upper map) and September 1 -24, 2020 (lower map). Maps by the Weather Data Library.

Sorghum is also sensitive to cold temperatures during most of its growth period. Temperatures

below 40 °F will inhibit sorghum growth. Previous K-State research by Staggenborg and Vanderlip documented the impact on the grain weight early during the grain-filling period when temperatures were below 30 °F. The low temperatures at this time caused lower photosynthetic rates and the inability of the plant to move carbohydrates to the developing grains. From mid-August until this current week (September 24, 2020), the lowest minimums reached 30 °F in a small area of western Kansas.

Grain sorghum life cycle progression

The amount of time between emergence and half-bloom will depend on the planting date and the temperatures during this period. There are also hybrid differences in the amount of time it takes to go from emergence to flowering. Short-season hybrids have a shorter time from emergence to blooming; while full-season hybrids will need more degree days to reach flowering. The overall cumulative GDD from flowering to maturity is about 800-1200 (based on 50 °F as the base temperature), with the shortest requirement in GDD for short-season hybrids. Before maturity, from beginning of grain filling (soft dough until maturity), grain moisture content within a grain will go from 80-90% to 25-35% where black layer is usually formed (Figure 2). From maturity ("black-layer" near the seed base; Figure 3) to harvest time, sorghum grain will dry down from about 35 to 20 percent moisture, but the final maximum dry mass accumulation and final nutrient content will have already been attained at maturity.

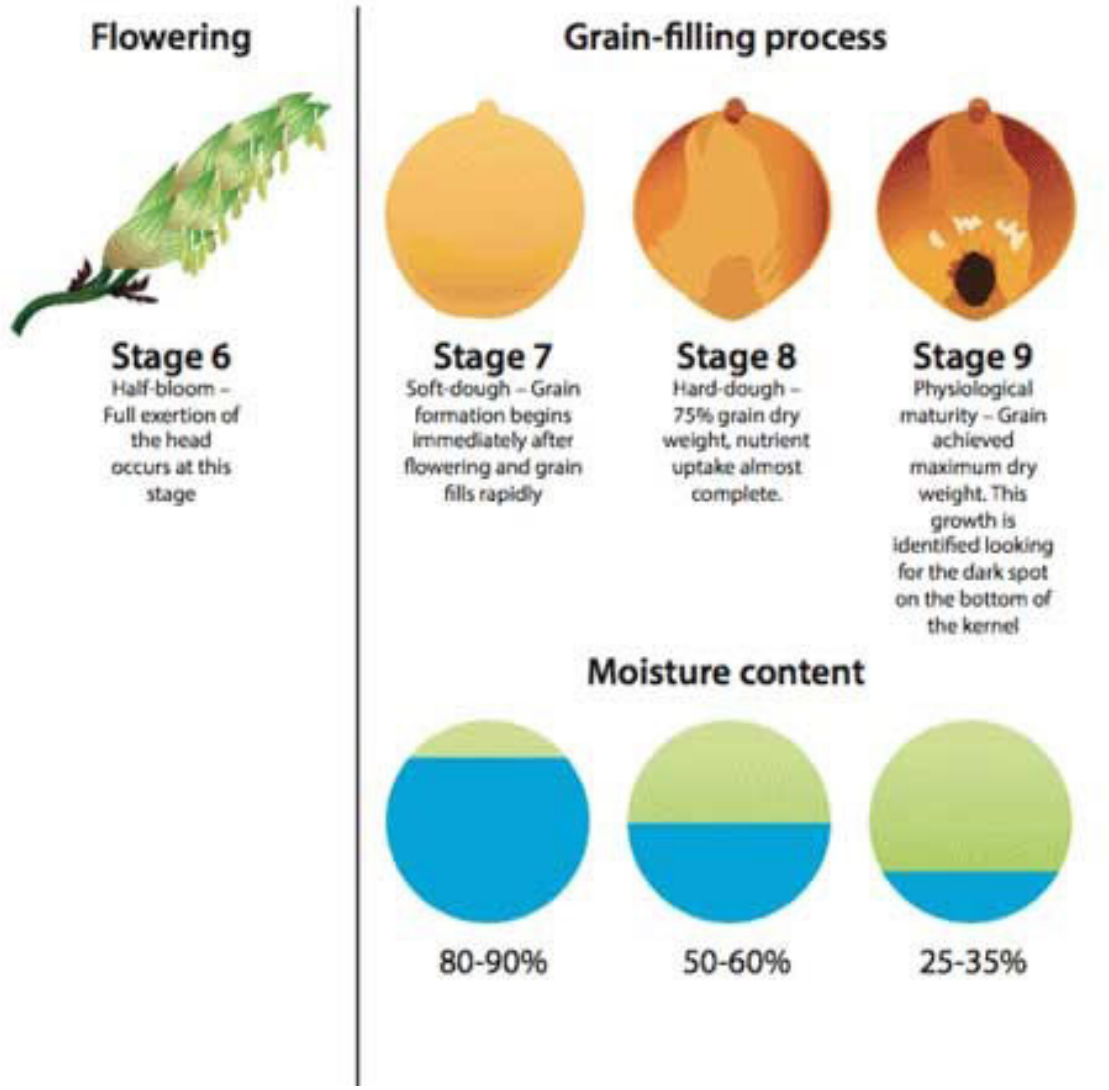

Figure 2. Sorghum growth stages from half-bloom and grain filling (including soft dough, hard dough, and physiological maturity). Infographic representing changes in grain coloration and moisture content during grain filling period until black layer formation, maturity. (K-State Research and Extension).

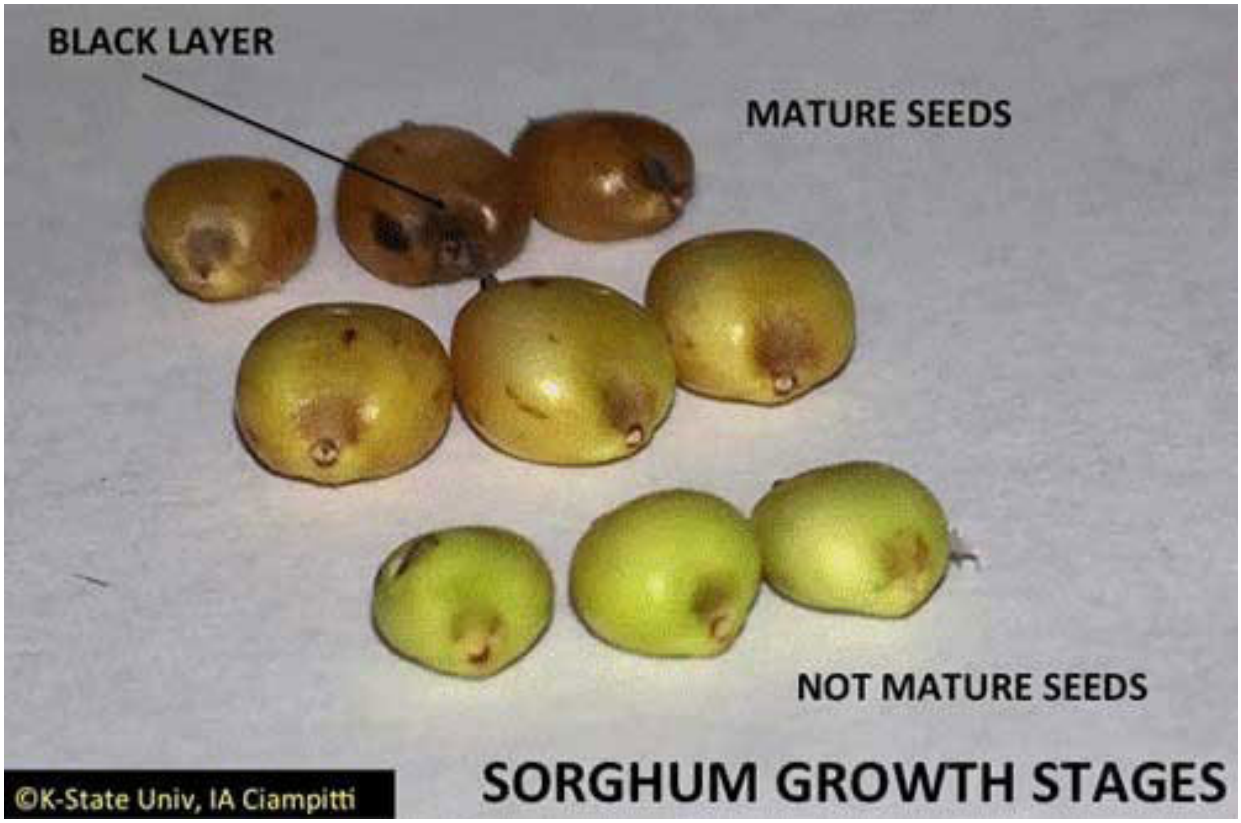

Figure 3. Black-layer identification in sorghum. Photo by Ignacio Ciampitti, K-State Research and Extension.

The likelihood of sorghum maturing before a freeze is related to all of these factors. When the crop flowers in late August or early September, it may not reach maturity before the first fall freeze in some parts of the state.

Probability of sorghum maturing before freeze

The map in Figure 4 show accumulated GDDs up to September 10 for the current growing season, starting at August 1 and September 1. Lower GDDs are depicted with blue colors, while higher GDDs are represented in red colors.

If blooming occurred during mid-August, the likelihood for maturing before freeze is high in most of the areas of the state that have accumulated 1100 GDDs (Figure 4). There are some areas of the state where sorghum GDDs accumulation was below 1100 (primarily related to light blue colors in Figure 4). Those areas will have a slight lower chance of maturing (having accumulated less than 1200 GDDs) before the first freeze. A worse picture is projected for the extreme northwestern area of the state (dark blue colors in Figure 4). In this case, there is a lower probability of maturing before the first freeze (low GDDs, <1000) but it will depend also on the hybrid maturity.

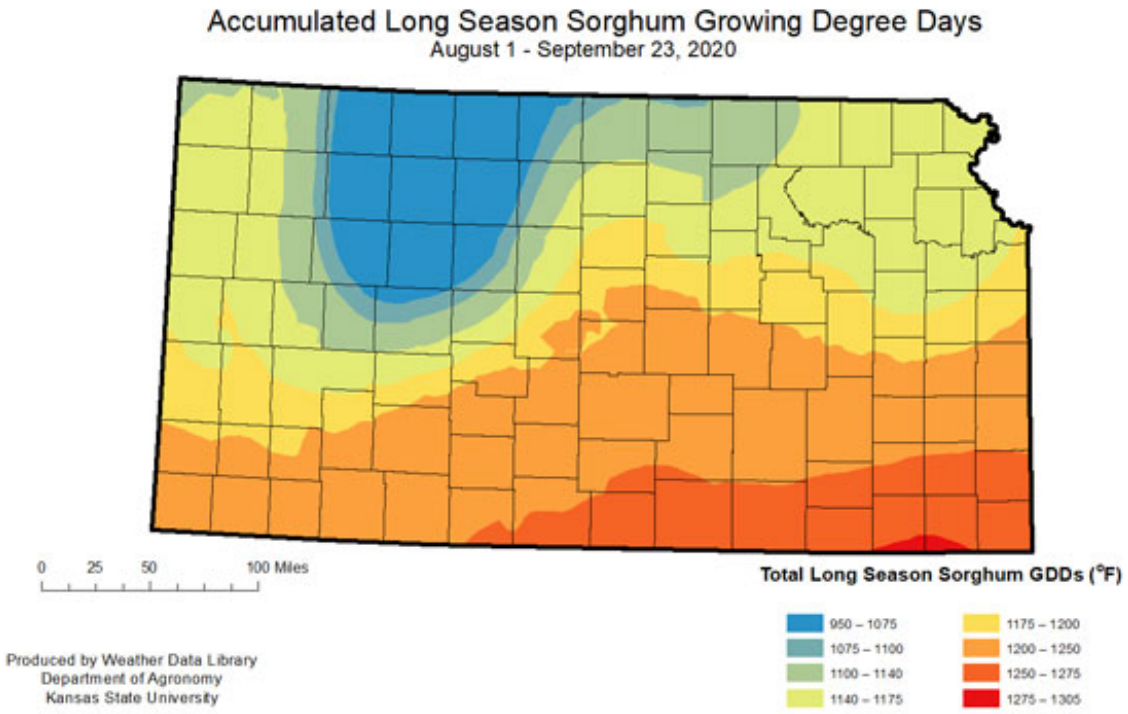

Figure 4. Accumulated Growing Degree Days (expressed in degrees F) for August 1-September 23. The darker the red, the higher the number of accumulated GDDs.

Management considerations

From a management perspective, the best way to mitigate this issue is to plan in advance. Recommended practices are just related to improve the use of different hybrid maturity and a different planting date:

- Use early planting dates for full-season hybrids, or
- When planting later, use medium- to short-season hybrids

If the sorghum is killed by a freeze before maturity, producers should first analyze the crop for the test weight and yield potential before deciding whether to graze or harvest the grain sorghum for silage.

Additonal resources

"Harvesting Grain from Freeze-damaged Sorghum," K-State publication MF-1081: http://www.ksre.ksu.edu/bookstore/pubs/mf1081.pdf

"Fall freeze damage in summer grain crops", K-State publication MF-2234: https://www.bookstore.ksre.ksu.edu/pubs/MF2234.pdf

Ignacio Ciampitti, Crop Production and Cropping Systems Specialist
ciampitti@ksu.edu

Mary Knapp, Weather Data Library
mknapp@ksu.edu

3. Control woody plants on rangeland: Basal bark and cut-stump herbicide applications

Late summer and fall can be an excellent time to treat unwanted stands of woody plants. Scattered stands of individual trees should either be treated individually using the basal bark method (for labeled plants less than 4-6 inches in diameter) or the cut stump treatment method. The basal bark and cut stump treatments will not be effective if the plants cannot be treated down to the soil line. Avoid conditions where water (or snow later in the season) prevents spraying to the ground line.

Basal bark application method

Producers can treat smaller diameter susceptible woody plants individually this fall by spraying the basal stem parts with triclopyr plus diesel fuel. The lower 12-15 inches of the stems or trunks of susceptible small trees should be thoroughly wetted on all sides with a triclopyr-diesel mixture. Triclopyr goes by the tradenames Remedy Ultra and Pathfinder II. Remedy Ultra is a 4 lb/gallon product. The labeled recommendations for Remedy Ultra are 20-30% solution in diesel. Pathfinder II is a ready-to-use product and does not have to be mixed with diesel. PastureGard HL is a premix of triclopyr and fluroxypyr, and can be applied as a basal bark or cut-stump treatment as a 25% solution in diesel. Crossbow, a mixture of triclopyr and 2,4-D, can also provide control of certain woody plants as a 4% solution in diesel. Milestone, with the active ingredient aminopyralid, is effective on black and common honeylocust. Mix Milestone 5% v/v with a compatible basal oil; e.g. Dyne-Amic from Helena Chemical. Before selecting a basal oil, do a jar test by mixing Milestone and basal oil to determine compatibility.

Cut-stump method

If the woody plant is greater than 6 inches in diameter, the best method is to:

- Cut it off at ground level.
- Treat the cut surface with triclopyr and diesel fuel within 30-60 minutes, before the sap seals over the exposed area.
- Spray the cambium and light-colored sapwood to insure translocation of the herbicide (Figure 1).
- Treat any exposed trunk or exposed roots.

The stump of ash, cottonwood, elm, oaks, persimmon, willow, and Russian olive can be treated with a 1:1 ratio of dicamba (Clarity, Sterling Blue) in water instead of triclopyr if desired. The stumps of Eastern red cedar do not need to be treated since, unlike many woody plants, this species does not root sprout. Simply cutting Eastern red cedar below the lowest green branch will kill it. Common trees in Kansas that re-sprout after cutting include: ash, cottonwood, elm, oaks, osage orange (hedge), persimmon, black and common honey locust, saltcedar, and Russian olive. In sprouting species, new shoots arise from dormant buds at or below the ground often resulting in a multi-stemmed clump.

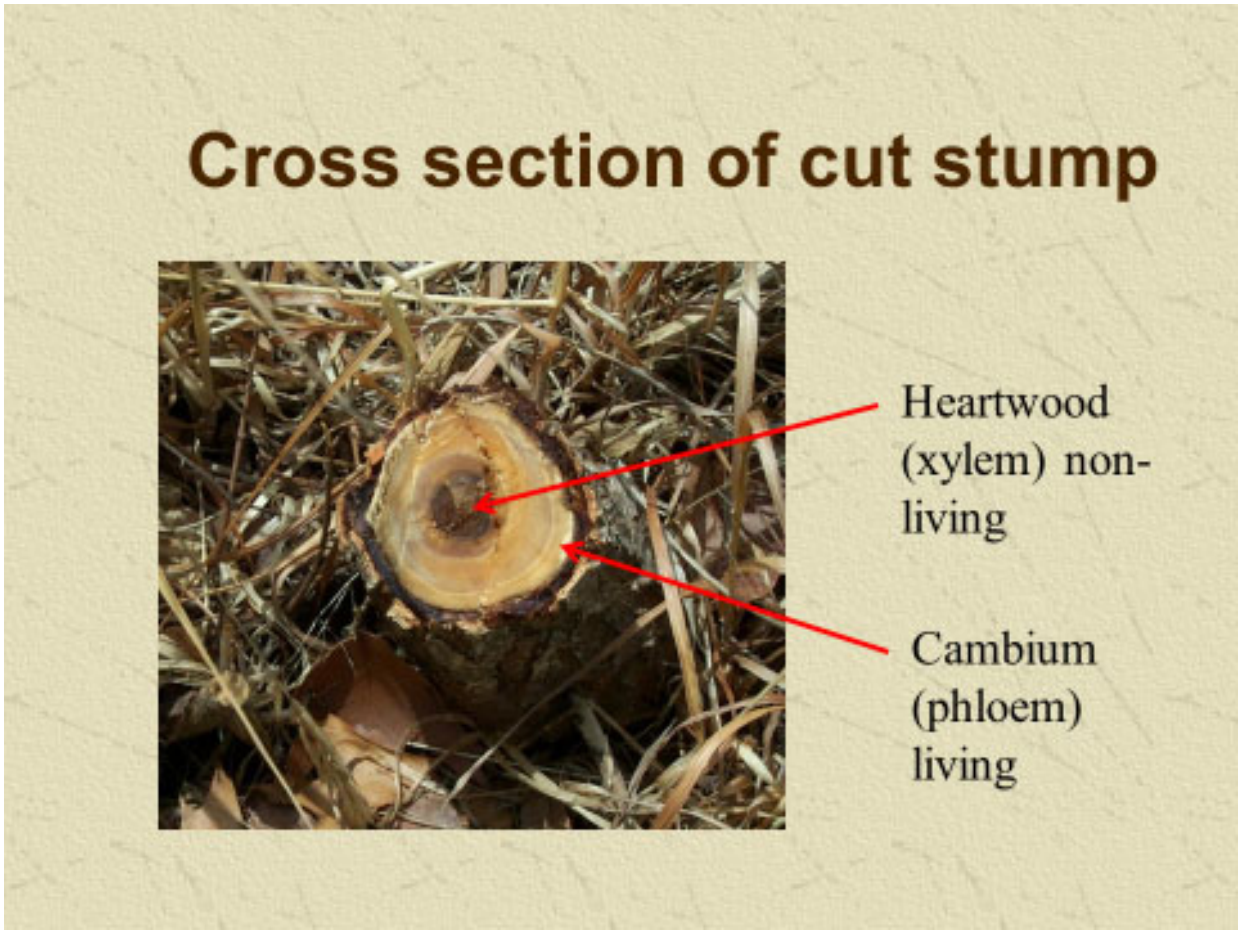

Figure 1. Treat the cambium tissue for cut-stump treatments.

Table 1. Cut-Stump Herbicides

Herbicide	Active ingredients per gallon	Rate
Crossbow[1]	2 lb 2,4-D + 1 lb triclopyr	4% in diesel
Remedy Ultra	4 lb triclopyr	20-30% in diesel
Pathfinder II	0.75 lb triclopyr	Ready to use
PastureGard HL	3 lb triclopyr + 1 lb fluroxypyr	25% in diesel
Milestone	2 lb aminopyralid	10% in water
Sterling Blue/Clarity	4 lb dicamba	25-50% in water
Roundup PowerMAX	5.5 lb glyphosate	50-100% in water
Arsenal	2 lb imazapyr	10% in water
Tordon 22K	2 lb picloram	10% in water
Capstone	0.1 lb aminopyralid + 1 lb triclopyr amine	Undiluted

[1] Trade names are used to help identify herbicides. No endorsement is intended, nor is any criticism implied of similar products not mentioned.

Common honeylocust can re-sprout from a wide diameter area around the main plant because of root suckers. One option is to make a basal bark treatment with triclopyr-containing products to kill the entire plant in the fall. Then the main plant can be cut down in subsequent years once the tree is dead. Cut-stump applications of Milestone as a 10% solution in water has been more effective than triclopyr on common honeylocust.

Table 2. Cut-Stump Treatments

Species	Herbicides
Ash	Crossbow, Pathfinder II, PastureGard HL, Banvel/Clarity, Arsenal, Capstone
Common honeylocust	Remedy Ultra, Pathfinder II, PastureGard HL, Milestone, Sterling Blue/Clarity, Tordon 22K, Capstone
Cottonwood	Crossbow, Remedy Ultra, Pathfinder II, Sterling Blue/Clarity, Arsenal, Tordon 22K, Capstone
Elm	Crossbow, Remedy Ultra, Pathfinder II, PastureGard HL, Banvel/Clarity, Arsenal, Tordon 22K, Capstone
Oaks	Remedy Ultra, Pathfinder II, PastureGard HL, Banvel/Clarity, Roundup PowerMAX, Arsenal, Tordon 22K, Capstone
Osage orange (hedge)	Remedy Ultra, Pathfinder II, PastureGard HL
Persimmon	Remedy Ultra, Pathfinder II, PastureGard HL, Sterling Blue/Clarity, Arsenal, Capstone
Russian olive	Crossbow, Pathfinder II, Sterling Blue/Clarity, Arsenal
Salt cedar	Remedy Ultra, Pathfinder II, PastureGard HL, Roundup Power MAX, Arsenal
Willow	Crossbow, Remedy Ultra, Pathfinder II, PastureGard HL, Roundup PowerMAX

Tordon RTU and Pathway can be used on cut surfaces in noncropland areas such as fence rows, roadsides, and rights-of-way. However, Tordon RTU, and Pathway are not labeled for use on range and pasture. Glyphosate labels vary on what sites are labeled for cut-stump application on rangeland. Roundup PowerMAX can be applied on any terrestrial site. Roundup ULTRA can only be applied as a cut-stump treatment on non-cropland. Be sure to check the label as rangeland is sometimes included as a site under non-cropland on some glyphosate labels.

Application equipment for cut-stump application includes pressurized hand sprayers, small backpack sprayers, sprayer mounted on ATV with handheld gun, hydraulic tree shears or saws with an attached spray nozzle, or even a paint brush. Two of the more common pieces of equipment for cutting the woody plants are the turbo saw and the hydra clip (Figure 2).

Figure 2. Turbo saw (left) and hydra clip (right).

Although exposure to animals is reduced by basal and cut-stump treatments, grazing and haying restrictions still need to be followed. There are no restrictions before grazing with any of the herbicides discussed. Check labels for restrictions for use prior to hay harvesting, removal of animals before slaughter, and for use around lactating dairy animals.

Application tips for using cut-stump treatments

- Always follow directions on the herbicide label.
- Before spraying, brush any sawdust or debris off cut surface.
- Apply herbicide to freshly cut stump.
- Spray cut surface and stump to ground level.
- Spray exposed roots above soil surface.
- The cambium layer is the critical area to spray.
- Apply enough liquid that it pools on cut surface.

Walt Fick, Rangeland Management Specialist
whfick@ksu.edu

4. Fall control of bindweed

Field bindweed is a deep-rooted perennial weed that severely reduces crop yields and land value. This noxious weed infests just under 2 million acres and is found in every county in Kansas. Bindweed is notoriously difficult to control due to its ability to store large amounts of energy in roots. Field bindweed produces over 2 tons of roots per acre! Because of this large energy reserve, field bindweed is especially difficult to control with a single herbicide application. During the fall, but prior to a killing freeze, can be an excellent time to treat field bindweed because it is moving carbohydrate deep into its root system during this period, which can assist the movement of herbicide into the root system.

Figure 1. Field bindweed ready for a fall treatment. Photo by Curtis Thompson, K-State Research and Extension.

The most effective control program includes preventive measures over several years in conjunction with persistent and timely herbicide applications. The use of narrow row spacings and vigorous, competitive crops such as winter wheat or forage sorghum may aid control. No-till has been very beneficial for managing bindweed by providing routine herbicide treatments through time and not

breaking up the root system and dragging root segments around the fields. No-tillage maintains much of the bindweed seed soil bank at a depth too deep to germinate, so it is common to see a resurgence of bindweed after tilling fields that have been in long-term no-till.

Herbicides in Group 4, such as dicamba, Tordon, 2,4-D ester, and Facet L, as well as glyphosate applied alone or in various combinations are registered for suppression or control of field bindweed in fallow and/or in certain crops, pastures, and rangeland (Tables 1-3). Additional noncropland treatments for bindweed control include Krenite S, Plateau, and Journey.

Applications of 2,4-D ester and glyphosate products are most effective when spring-applied to vigorously growing field bindweed in mid to full bloom. However, dicamba and Tordon applications are most effective when applied in the fall. Herbicide treatments are least effective when applied when bindweed plants are stressed. Even the most effective herbicides rarely eliminate established bindweed stands following a single application.

Considerable research has been done on herbicide products and timing for bindweed control. Although the research is not recent, the products used for bindweed control and the timing options for those products haven't changed much since this work was done. As a result, the research results in the tables below remain very useful today.

Table 1. Fall vs. spring and summer herbicide application for control of field bindweed in the Texas Panhandle: 1976-1982.

		Season of application		
	Rate (lbs ai/acre)	Spring (April or May)	Summer (June, July, or Aug.)	Fall (Sept. or Oct.)
Treatment		**% Control one year after treatment**		
Glyphosate	2.9	83	77	60
Dicamba	1.0	56	41	71
2,4-D ester	1.0	65	49	55
Tordon + 2,4-D ester	0.25 + 0.5	55	56	84
Tordon + Dicamba	0.25 + 0.25	47	73	87
Tordon + Glyphosate	0.20 + 1.6	52	73	79
		% Control two years after treatment		
Glyphosate	2.9	67	63	32
Dicamba	1.0	31	37	34
2,4-D ester	1.0	46	42	10

Source: Field Bindweed Control in Field Crops and Fallow, MF-913
http://www.ksre.ksu.edu/bookstore/pubs/MF913.pdf

Table 2. September-applied treatments for control of field bindweed: Randall Currie and Curtis Thompson, Southwest Research-Extension Center 1992-1993.

Treatment	Rate	Average % control in spring
Dicamba	4 oz	31
Dicamba	8 oz	44
Dicamba	1 pt	85
2,4-D	1 pt	48
Dicamba + 2,4-D	8 oz + 8 oz	82
Paramount	5.3 oz	91
Paramount + Dicamba	5.3 oz + 4 oz	98
Paramount + Dicamba	5.3 oz + 8 oz	97

Source: 1995 Field Day Southwest Research-Extension Center, Report of Progress 739
http://www.ksre.k-state.edu/historicpublications/pubs/SRP739.pdf

Table 3. September-applied treatments for control of field bindweed: Randall Currie, Southwest Research-Extension Center 1992-1997.

Treatment	Rate	Average % Control in Spring
Dicamba	4 oz	19
Dicamba	8 oz	65
Dicamba	1 pt	89
2,4-D	1 pt	72
2,4-D	1 qt	81
Glyphosate	1 qt (IPA)	68
Paramount	5.3 oz	90
Tordon	8 oz	75
Tordon	1 pt	98

Source: 1999 Field Day Southwest Research-Extension Center, Report of Progress 837
http://www.ksre.k-state.edu/historicpublications/pubs/SRP837.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.

For more information on controlling bindweed, see 2020 Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland, K-State publication SRP-1148.

Don't miss the companion article in the eUpdate on controlling bur ragweed, another difficult to control noxious weed in Kansas.

Sarah Lancaster, Extension Weed Science Specialist
slancaster@ksu.edu

Randall Currie, Weed Scientist, KSU Southwest Research-Extension Center, Garden City
rscurrie@ksu.edu

5. World of Weeds: Bur ragweed or woollyleaf bursage

For many perennial weeds, proper timing of herbicide applications is key. Early fall is a good time to spray for control of perennial broadleaf weeds such as bur ragweed, bindweed, and Canada thistle. As we move into October, this month's World of Weeds article focuses on bur ragweed (Figure 1). Don't miss an accompanying article in this eUpdate issue on controlling bindweed, another troublesome noxious weed found in Kansas.

Ecology of bur ragweed

Bur ragweed (also called woollyleaf bursage) is a perennial broadleaf weed, and is classified as a noxious weed in Kansas. It is a significant problem on over 94,000 acres throughout the state (Figure 1). It is adapted to low-lying areas where water collects in cultivated fields or in noncropland areas. Its ability to extract water with its deep perennial root system, which can reach a depth of 15 feet, allows bur ragweed to survive extended periods of drought or harsh weather. These characteristics make bur ragweed very difficult to control.

Bur ragweed is extremely competitive with crops, and can reduce grain yield by 100 percent in dry years. Even with irrigation, losses of 40 to 75 percent are common. Bur ragweed is more competitive with summer crops than with winter wheat because bur ragweed growth is minimal during much of the winter wheat life cycle. However, in dry years, bur ragweed will deplete soil moisture for fall-planted wheat and will thereby reduce grain yield.

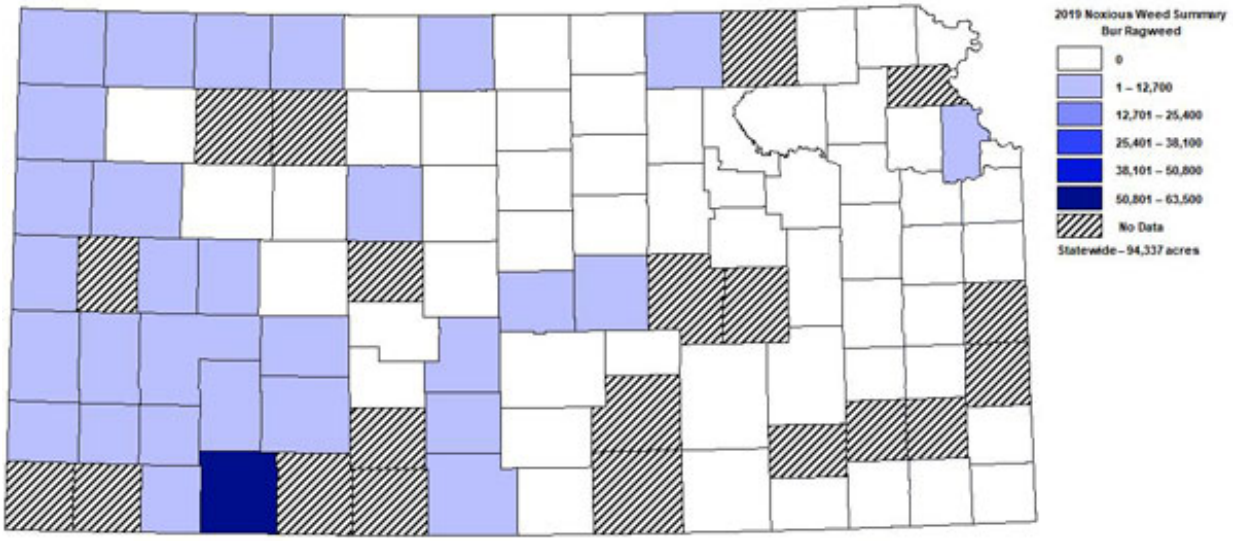

Figure 1. Distribution of bur ragweed in Kansas, in terms of acreage. Map from the 2019 Noxious Weed Summary.

Identification

Shoots of bur ragweed will grow from root buds, emerging during April. It has silvery-grayish foliage covered with dense white hairs (Figure 2). Plants exhibit an erect growth habit and will reach 1 to 2 feet tall. Flower development begins in late July or early August. The fruits or "burs" can be up to 1/3 inch in length, are light-tan, and the hull is covered with sharp, hooked barbs.

Seed contributes to the spread of bur ragweed and likely is a source of new infestations. New plants also arise from the vegetative buds, which develop on the root stocks, thus contributing to the spread of bur ragweed. Tillage also can redistribute vegetative buds, aiding the spread of bur ragweed.

Figure 2. Bur ragweed. Photo by Curtis Thompson, K-State Research and Extension.

Management

Bur ragweed control is most effective when plants are treated in late summer or fall, prior to a killing frost, with Tordon tank-mixed with dicamba or 2,4-D ester. As with all herbicide applications, control will not be as effective if the bur ragweed plants are under stress at the time of treatment. Bur ragweed is a difficult weed to control, and a single application will usually not be sufficient. Fall

application of the Group 4 herbicides mentioned above followed by glyphosate treatments in glyphosate-tolerant crops during the growing season can help manage bur ragweed long-term. However, spring crops may be injured severely from fall applications of Tordon. Wheat has the most tolerance and can be planted 45 days following a ½ pint of Tordon 22K application. Grain sorghum can be planted 8 months after application of 1 pt Tordon 22K

Table 1. Control of bur ragweed in western Kansas with mid-September treatments

Treatment	Rate/Acre	% Control 11 months after treatment (2-year average)
Tordon + Banvel	1 pt +1 pt	82
Tordon + 2,4-D LV4	1 pt + 1 qt	74
Roundup Power Max + Banvel	44 oz + 1 pt	16
Roundup Power Max + 2,4-D LV4	44 oz + 1 qt	27

Source: Woollyleaf Bursage Biology and Control, MF 2239 http://www.ksre.ksu.edu/bookstore/pubs/MF2239.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.

Helpful resources

2020 Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland, K-State publication SRP-1148

Woollyleaf Bursage Biology and Control, K-State publication MF-22239.

Sarah Lancaster, Extension Weed Science Specialist
slancaster@ksu.edu

Randall Currie, Weed Scientist, KSU Southwest Research-Extension Center, Garden City
rscurrie@ksu.edu

6. K-State wheat specialists release informative videos on wheat production

A new resource is now available for Kansas wheat growers and other interested stakeholders.

Extension wheat specialist, Dr. Romulo Lollato, and Extension wheat pathologist, Dr. Kelsey Andersen Onofre, have collaborated to create the KSU Wheat YouTube channel.

This channel will feature timely and informative videos that target a wide range of wheat production topics. The first video series offers a recap of the 2020 growing season and the latest wheat variety performance trials. More videos will be uploaded throughout the coming months.

There is no cost to view and access these videos. You can subscribe to the KSU Wheat channel by clicking the image below or the following link:
https://www.youtube.com/channel/UCg7AkbHMH3ARt5nqHIZzRRA

Stay tuned for upcoming videos from the KSU Wheat team!

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

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

Kansas State University Department of Agronomy
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
www.agronomy.ksu.edu | www.facebook.com/KState.Agron | www.twitter.com/KStateAgron