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eUpdate

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These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Pre-emergence herbicides for grain sorghum

Pre-emergence herbicide programs for corn were discussed in a recent eUpdate. The role of pre-emergence herbicides is similar in both corn and grain sorghum, and some herbicides are similar. But, fewer post-emergence herbicide options, particularly for Palmer amaranth and grass control, make an effective pre-emergence herbicide even more important for successful sorghum production. A table summarizing weed species response to various grain sorghum herbicides can be found on page 48 of 2021 *Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland* (SRP 1162) at: https://bookstore.ksre.ksu.edu/pubs/SRP1162.pdf

Herbicide groups of soil-applied residual herbicides for grain sorghum

Photosystem II inhibitors (Group 5). Atrazine is a common component of many pre-plant and pre-emergence herbicide premixes for sorghum. It controls a wide variety of broadleaf weeds, including pigweeds, ragweeds, morningglories, and mustards, as well as some grasses. However, atrazine resistance has been reported for many weed species. Atrazine use rate is influenced by soil type, soil pH, and organic matter, and use is prohibited in instances where water contamination is likely. Unless your situation prohibits atrazine use, it is recommended to include atrazine when you apply Group 15 and Group 27 herbicides.

Fatty acid inhibitors (Group 15). Dimethamid-P (Outlook), *S*-metolachlor (Dual II Magnum), metolachlor, and acetochlor, are also a common component of many pre-plant and pre-emergence herbicide premixes for sorghum. In general, these products are very effective in controlling most annual grasses and small-seeded broadleaf weeds, except kochia. Though resistance to Group 15 herbicides have been reported in other states, resistance has not been confirmed in Kansas to date. Group 15 products are most effective when applied with atrazine, unless atrazine is not allowed.

HPPD-inhibitors (Group 27). Mesotrione (Callisto, others) controls kochia, pigweeds, velvetleaf, and many other broadleaf weeds, as well as grasses. Mesotrione should be applied with atrazine, which is often included in premixes (Lexar EZ, Lumax EZ, others). Some mesotrione-resistant weed populations have been identified in Kansas.

PPO-inhibitors (Group 14). Saflufenacil (Sharpen) controls pigweeds well; however, kochia control is marginal. Verdict (saflufenacil + dimethenamid-P) has excellent activity on pigweeds, kochia, and large-seeded broadleaf weeds. However, the length of residual activity can be shorter than other pre-emergence products.

Another pre-emergence option that is new for grain sorghum in 2021 is **imazamox (IMIFLEX).** Imazamox is an ALS-inhibitor (Group 2) that will control grasses such as foxtails, crabgrass, fall panicum, and barnyardgrass. It will also control cocklebur, sunflower, velvetleaf, and pigweeds – if the populations have not developed resistance. Imiflex can only be used in igrowth grain sorghum varieties. Additional comments about igrowth grain sorghum can be found in eUpdate Issue 833 in an article titled "IMIFLEX herbicide receives EPA approval for igrowth grain sorghum".

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.

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2. First hollow stem update: April 8, 2021

Cattle should be removed from wheat pastures when the crop reaches first hollow stem (FHS). Grazing past this stage can severely affect wheat yields (for a full explanation, please refer to the eUpdate article "Optimal time to remove cattle from wheat pastures: First hollow stem").

First hollow stem update

In order to screen for FHS during this important time in the growing season, the K-State Extension Wheat and Forages crew measures FHS on a weekly basis in 34 different commonly grown wheat varieties in Kansas. The varieties are in a September-sown replicated trial at the South Central Experiment Field near Hutchinson. Ten stems are split open per variety per replication (Figure 1), for a total of 30 stems monitored per variety. The average length of hollow stem is reported for each variety in Table 1.

Figure 1. Ten main wheat stems were split open per replication per variety to estimate first hollow stem for this report, for a total of 30 stems split per variety. Photo by Romulo Lollato, K-State Research and Extension.

Table 1. Length of hollow stem measured March 3, 8, 16, 22, 25, and 31, and April 5, 2021 of 34 wheat varieties sown mid-September 2020 at the South Central Experiment Field near Hutchinson. The critical FHS length is 1.5 cm (about a half-inch or the diameter of a dime).

Value(s) in bold indicate varieties that have reached FHS.

	First hollow stem						
Variety	3/3/21	3/8/21	3/16/21	3/22/21	3/25/21	3/31/21	4/5/21
	---------- cm ----------						
10BC329-17-5	0.00	0.01	0.03	0.42	0.36	**3.30**	**.**
AP EverRock	0.00	0.00	0.46	0.98	2.10	**.**	**.**
AP Roadrunner	0.00	0.13	0.21	0.42	0.69	**3.27**	**.**
Buckhorn AX	0.01	1.16	2.76	.	.	**.**	**.**
Canvas	0.00	0.00	0.07	0.02	0.38	**2.60**	**.**
Crescent AX	0.00	0.00	0.14	0.15	0.91	**4.97**	**.**
High Country	0.00	0.01	0.03	0.69	1.27	**4.47**	**.**
KS12DH0156-88	0.00	0.00	0.02	0.12	0.43	1.10	**4.16**
KS13DH0041-35	0.01	0.00	0.00	0.21	0.95	**1.77**	**.**
KS Dallas	0.00	0.00	0.12	0.78	0.84	**2.93**	**.**
KS Hamilton	0.00	0.00	0.01	0.00	0.15	1.37	**5.01**
KS Hatchett	0.00	0.00	0.10	0.18	1.02	**4.60**	**.**
KS Silverado	0.01	0.00	0.01	0.00	0.05	1.33	**4.11**
KS Western Star	0.00	0.01	0.13	0.34	0.35	**1.90**	**.**
LCS Atomic AX	0.00	0.00	0.00	0.14	0.58	**1.93**	**.**
LCS Helix AX	0.00	0.00	0.06	0.30	1.23	**3.33**	**.**
LCS Julep	0.00	0.00	0.03	0.29	0.41	**2.87**	**.**
LCS Photon AX	0.00	0.00	0.34	0.68	1.96	**.**	**.**
LCS Revere	0.00	0.00	0.19	0.50	1.08	**5.00**	**.**
Long Branch	0.00	0.03	0.54	1.66	.	**.**	**.**
MS Maverick	0.00	0.00	0.12	0.31	0.39	**2.47**	**.**
NUSAKA15-3	0.00	0.03	0.19	0.46	1.22	**4.27**	**.**
OCW04S717T-6W	0.00	0.01	0.13	0.49	0.71	**2.70**	**.**
OK12912C-138407-2	0.00	0.00	0.00	0.07	0.06	1.23	**3.65**
OK16D101089	0.00	0.01	0.26	0.79	1.31	**3.87**	**.**
OK Corral	0.00	0.02	0.08	0.56	0.67	**2.83**	**.**
Paradise	0.00	0.01	0.02	0.51	0.40	**2.83**	**.**
Rock Star	0.00	0.00	0.04	0.24	0.17	0.87	**4.18**
Showdown	0.00	0.00	0.07	0.20	0.30	**2.53**	**.**
Smith's Gold	0.00	0.11	0.14	0.82	0.61	**2.53**	**.**
WB4269	0.00	0.06	0.18	0.38	0.69	**2.90**	**.**
WB4401	0.00	0.09	0.38	0.62	1.15	**4.30**	**.**
WB4699	0.00	0.03	0.03	0.08	0.13	0.73	**3.67**
Zenda	0.00	0.02	0.31	1.04	1.72	**.**	**.**
Variety effect	ns	<0.01	<0.01	<0.01	<0.01	<0.01	0.88

All varieties evaluated in this trial had reached first hollow stem as of April 5, 2021. The latest varieties to reach it were KS12DH0156-88, KS Hamilton, KS Silverado, OK12912C-138407-2, Rock Star, and WB4699.

The intention of this report is to provide producers an update on the progress of first hollow stem development in different wheat varieties. Producers should use this information as a guide. While it is

extremely important to monitor FHS from an ungrazed portion of each individual wheat pasture to take the decision of removing cattle from wheat pastures, it is very likely that at this time, growers in the region should already have removed cattle from their fields to avoid unintended yield losses due to extended grazing.

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3. Key nutrients for soybean production in Kansas

Compared to corn, wheat, and sorghum, soybeans remove significant amounts of nutrients per bushel of grain harvested. Nutrient uptake in soybeans early in the season is relatively small. However, as they grow and develop, the daily rate of nutrient uptake increases. Soybeans need an adequate nutrient supply at each developmental stage for optimum growth. High-yielding soybeans remove substantial amounts of nutrients from the soil. For example, a 40-bushel/acre soybean crop removes approximately 30 pounds of P_2O_5 and 50 pounds of K_2O with the grain. An additional 10 pounds of P_2O_5 and 40 pounds of K_2O can be removed with the stover. This should be taken into account in an overall nutrient management plan.

Nitrogen (N)

Nitrogen is supplied to soybeans mainly by nitrogen fixation, and fertilizer nitrogen application is not recommended if the plants are well-nodulated (Figure 1). Soybeans are heavy users of N, removing a total of 130 pounds per acre, and about 44 pounds with the stover, for a 40-bushel-per-acre soybean crop. Soybeans use all the N they can fix, plus N from the pool of available N in the soil. Nitrogen fertilizer application to soybean seldom results in any yield benefit. Instead, efforts should focus on ensuring proper inoculation.

Figure 1. Nodulated soybeans (left) compared to soybeans without adequate nodulation

(right). Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Phosphorus (P)

Phosphorus applications should be based on a soil test. Responses to direct P fertilization is generally consistent in soils testing very low or low in soil test P. Response to starter P fertilizer application in soybeans can occur, but it depends on several factors. The most important factor is the soil test level. Generally, warmer soils at soybean planting, compared to corn, also may contribute to typically lower response to starter fertilizers in soybeans. However, starter fertilizer in soybeans can be a good way to complement nutrients that may have been removed by high-yielding crops in the rotation like corn. Banding fertilizer at planting is an efficient application method for soybeans. Keep in mind that soybean seeds are easily injured by fertilizer, therefore, no direct seed contact with fertilizer is advised.

Potassium (K)

Soybean seeds are relatively high in K and removal of K by soybeans is greater than for other crops on a per-bushel basis when only the grain is removed. As with P, a soil test is the best index of K needs. Soils testing very low or low should be fertilized with K, either as a banded starter at planting or broadcast and incorporated. Potassium should not be placed in contact with the soybean seed because of possible salt injury. Yield increases from K can be significant, and in some cases, more than yield responses to P for soils testing low or very low.

Sulfur (S)

Sulfur is a mobile nutrient in the soil (leaching is common), but fairly immobile in the plant. High soil test variability, along with significant uptake by crops, generates the need for proper S management, especially in sandier soils and fields with several different soil types. Recent studies in Kansas suggest a low probability of soybean response to S application. However, S removal with soybeans can be significant, and more sensitive crops in the rotation, such as wheat, may require S fertilization.

Iron (Fe)

Iron deficiency symptoms appear in irregularly-shaped spots randomly distributed across a field, primarily in fields with a previous history of iron deficiency. Different annual weather patterns can make iron chlorosis (yellowing of leaves) more or less prevalent. Iron chlorosis also differs under different soil conditions. In general, high soil pH and high carbonates (free lime) can increase the incidence of iron deficiency. Iron chlorosis can be a big limitation in some regions of western Kansas. Iron fertilizer using chelated sources, and in direct contact with the seed (in-furrow), has shown significant yield responses in soils with a history of iron deficiency. If iron chlorosis has been a common problem in the past, producers should select a soybean variety tolerant to iron deficiency. It may be beneficial to use a chelated iron in-furrow application. Foliar iron treatments seldom result in a yield increase.

Other nutrients

Zinc, manganese, and boron are other nutrients that can be limiting in soybeans. The need for zinc should be determined by soil tests. Zinc fertilizer can be either banded at planting or broadcast pre-plant with little difference in response when applied at an adequate rate. Both organic and inorganic

zinc sources (chelates and non-chelates) can be used, but chelates are considered more effective than the inorganic sources.

Manure applications also are effective at eliminating micronutrient deficiency problems, including iron. Monitoring nutrient levels with tissue analysis along with soil tests conducted during the crop season should be used to diagnose potential nutrient deficiencies. Stresses such as drought, heat, and pest pressure can all influence tissue test results.

Some micronutrients also can cause phytotoxicity if prevalent in large quantities. Nutrient removal by soybean is very high in high-yielding environments, thus fertilizer application rates should be high or soil test levels will drop. Regular soil testing (every 2 to 3 years) is essential for optimum nutrient management. Soybeans take advantage of residual phosphorus and potassium, but keep in mind the total nutrient needs in the rotation.

See K-State Research and Extension publication *Soil Test Interpretations and Fertilizer Recommendations*, MF2586 for more complete soybean fertilizer recommendations: http://www.ksre.ksu.edu/bookstore/pubs/MF2586.pdf

For more information, see *Kansas Soybean Management 2021*, K-State Research and Extension publication MF3154: http://www.ksre.ksu.edu/bookstore/pubs/MF3154.pdf

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4. Kansas Mesonet adds a new tool for tracking days between rainfall events

The Kansas Mesonet has created a new tool that reports the number of days since a measurable precipitation event. This information can be helpful when tracking activation of chemicals, assessing crop performance, and evaluating drought or flood risks.

The new page, located at https://mesonet.k-state.edu/precip/consecutive/, gives the number of consecutive days without rainfall for seven different thresholds ranging from 1/10th (0.10") of an inch to 2 inches. Stations that have gone more than a year without a given amount of rainfall are capped at 365 days.

The map provides a statewide overview, each number representing the current number of days since rainfall at Mesonet stations (Figure). Click or tap a station to get details for that location. Use the "Change Map" drop down menu to change the threshold.

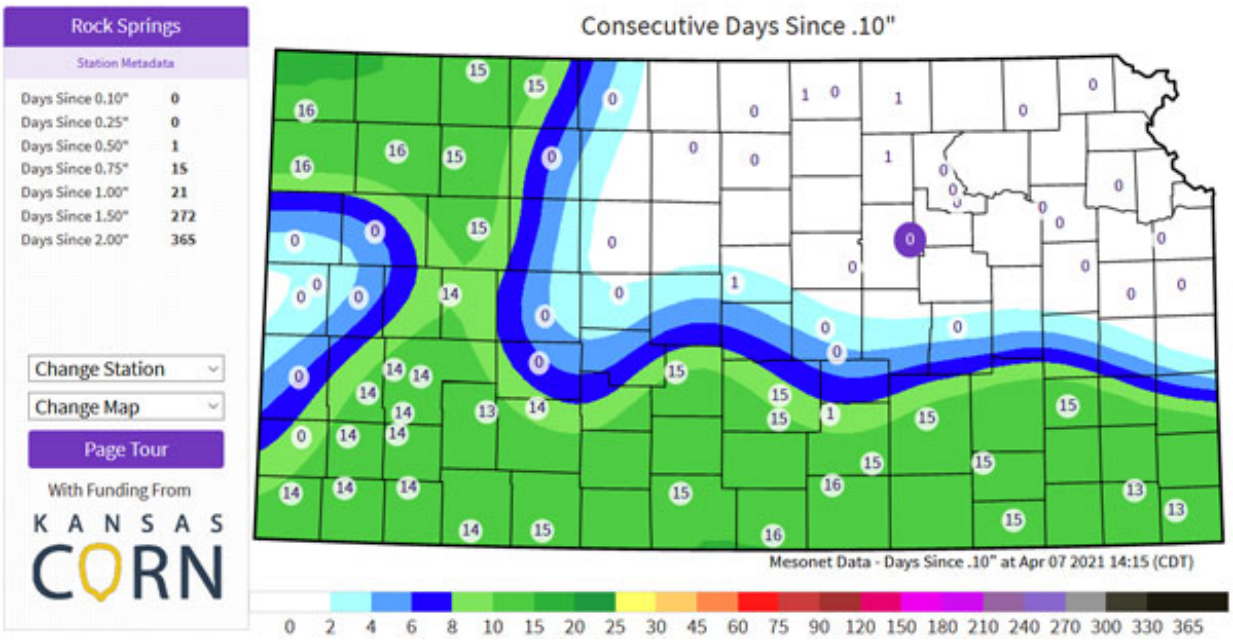

Figure 1. Example of the new tool that tracks the number of consecutive days since a measurable rainfall event. The statewide map provides an overview of all Mesonet stations. Users can select an individual station in the "Change Station" dropdown menu or by clicking on the map at their chosen location. The "Change Map" menu will allow users to choose from 7 different rainfall thresholds. Source: https://mesonet.k-state.edu/precip/consecutive/**.**

The Chart tab provides data for the past 365 days. Columns (black) show the daily observed precipitation (Figure 2). Shaded areas (blue) show the number of days since precipitation for the given threshold, falling to zero when the daily observation surpasses that threshold.

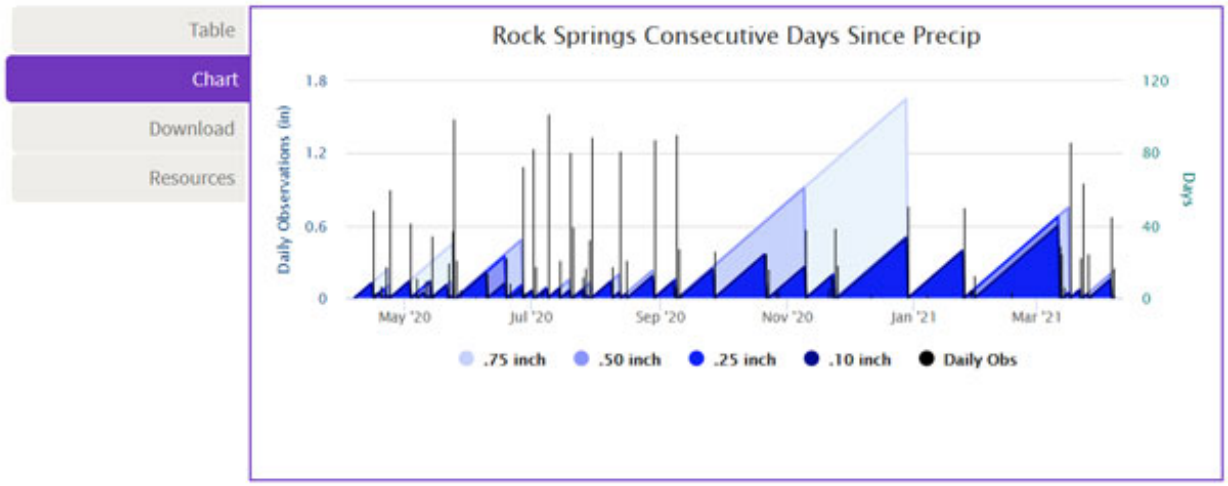

Figure 2. Example of the "Chart" feature for the new Mesonet tool that measures the number of days since the last rainfall event.

As with other Mesonet tools, all data and maps are available in the Download tab (Figure 3).

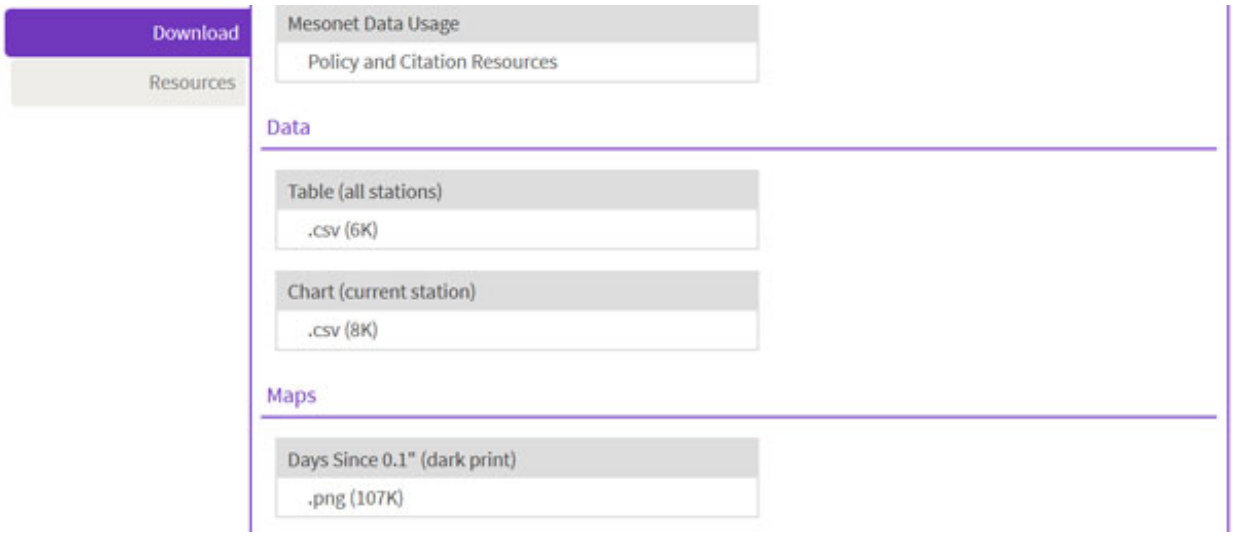

Figure 3. The "Download" feature allows users to save the data in various formats (table, chart, and map).

Here are some considerations for understanding the data:

- Amounts are reported as total observed precipitation in a period from midnight to midnight, CST. If a station receives an inch before midnight and an inch after midnight, it reports two 1-inch events rather than a single 2-inch event.
- Rainfall can be extremely localized. The measurement at one station may differ even a short

distance away and not match interpolations between locations. For another source of observed totals, see CoCoRaHS and consider becoming a CoCoRaHS observer (see a recent eUpdate article on the benefits of joining this network).
- Mesonet stations measure liquid precipitation. Freezing rain and snow are not measured until they melt, which may be some days after they fell, assuming it didn't blow out.

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Alfalfa Weevils

Alfalfa weevil larvae continue to feed and thus increase in size (Figure 1). However, after monitoring several fields throughout north central Kansas over the last 10 days, there was not yet any field that had a 50% infestation level. Infestation level is determined by the "stem count bucket" method where individual stems are removed and quickly shaken into a 1-gallon white bucket to dislodge any weevil larvae that may be present. Next, count the number of larvae in the bucket and divide into the number of stems shaken into the bucket to get the percent (%) of infested stems. Alfalfa weevil monitoring should continue, however, as we are still relatively early and more larvae will probably be hatching.

Figure 1 Alfalfa weevil larvae and leaf damage. Photo by Cody Wyckoff, K-State Research and Extension.

Pea Aphids

None of the fields sampled over the past 10 days had been treated with an insecticide. Thus, pea aphids are really prevalent and increasing in population density. However, much like alfalfa weevils, none of the fields monitored had infestation levels anywhere close to a treatment threshold. These pea aphid populations are often utilized by beneficials (see Figure 2 with pea aphids and parasitized pea aphids, called "mummies") early in the season to increase their populations, which often help against other pests in other crops, i.e. greenbugs, corn leaf aphids, soybean aphids, etc. Again, monitoring pea aphids should also continue until swathing.

Alfalfa weevils and pea aphids are considered cool-season pests and primarily affect alfalfa up to the 1st cutting. Most alfalfa weevil larvae detected (Figure 1) were late 1st/early 2nd instars, and thus will probably finish feeding in about 2 weeks at the temperatures predicted for that period of time (60-70's for daytime temperatures). Sampling for both alfalfa weevil larvae and pea aphids should continue until at least the 1st cutting.

Figure 2. Pea aphids and parasitized pea aphids. Photo by Cody Wyckoff, K-State Research and Extension.

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6. Kansas Ag-Climate Update for March 2021

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 2021: Quite Warm and Wet Experience for Wheat in March

March was much wetter than normal for all divisions, ranking as the 5th wettest March since 1895. As a percent of normal, the East Central Division was the driest with 3.85 inches, 145 percent of normal. The Northwest was the wettest, at 3.46 inches, 262 percent of normal. This resulted in improving drought conditions across the state.

March also had warmer than normal temperatures, with statewide average of 3.7 degrees warmer than normal, ranking it as the 22nd warmest March of record. Not many records were set in either the maximum or minimum temperatures. There were 13 new record high daily maximums, and 25 new record high daily minimums. These conditions promoted the spring development of the winter wheat crop, as the crop has started to elongate stem across the entire state, being close to flag leaf emergence in southern portions (Figure 1).

Figure 1. Wheat plots in Hutchinson, KS. Photo by N. Giordano, K-State Research and Extension.

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

7. Commercial applicator training offered in April

Are you an applicator that is still short some hours to renew your 2020 commercial applicator license or just want to get credits to renew this year? If your license expired during the COVID-19 State Disaster Emergency (2020), it shall remain valid until 90 days following the termination of the emergency declaration (date yet to be determined).

The Kansas State Pesticide Safety Program is providing a training opportunity this April for several of the categories to help individuals renew. This training will be offered in a virtual format via Zoom. These will be the only trainings offered by the program this spring. In order to hold the training, we must have at least 20 registered participants.

Training dates and categories:

April 21-22 Right-of-Way, Industrial Weed, and Noxious Weed (7 hours 6, 7C & 9A plus core)

April 28-29 Forestry, Ornamental, Turf and Interiorscape (5 hours 2/3C, 7 hours 3A/3B plus core)

April 30 Ag Plant (7 hours 1A plus core)

Training information is available at https://www.ksre.k-state.edu/pesticides-ipm/commercial-applicator.html or e-mail fmiller@ksu.edu to have the flyer e-mailed to you!

K-STATE Research and Extension | Integrated Pest Management and Pesticide Safety Education

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