Issue 914

K-STATE Research and Extension

## Extension Agronomy

# eUpdate

*07/07/2022*

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. Palmer amaranth control in grain sorghum

Pre-emergence herbicides are critical for successful weed management in grain sorghum, especially for difficult to control species like Palmer amaranth. However, difficult weather conditions this spring has resulted in questions about controlling rapidly-growing Palmer amaranth in grain sorghum fields.

**Figure 1. Palmer amaranth in a well-advanced grain sorghum field that escaped effective treatment earlier in the growing season. Photo by Sarah Lancaster, K-State Research and Extension.**

Post-emergence herbicide options in grain sorghum are limited. All of the available options are most effective when small (under 4 inches tall) weeds are targeted. This article will review the pros and cons of key post-emergence herbicides that control Palmer amaranth in grain sorghum. Combinations of the herbicides listed here will generally improve control.

**Atrazine** can control sensitive populations of Palmer amaranth and can be combined with other herbicides to enhance effectiveness. Recommended rates range from 0.25 to 2.0 pounds of atrazine (0.5 to 4 pints). Atrazine should be applied with crop oil or surfactant to control emerged weeds. Atrazine can be applied to grain sorghum between 3-leaf and 12 inches or between 6 and 12 inches in western Kansas. Observe rate limits for your area.

**Aim** (carfentrazone) is a Group 14 herbicide that can be applied to grain sorghum between 4 inches and boot stage. It is less effective than some of the other herbicides in this article and requires good

coverage for maximum effectiveness. Aim can be tank-mixed with atrazine, 2,4-D, dicamba, bromoxynil, and Huskie. Aim is likely to burn grain sorghum leaves, especially if applied in very hot, humid weather or if applied with crop oil. Leaf burn will also be greater if Aim is applied with bromoxynil.

**2,4-D** is an effective herbicide option to control Palmer amaranth. However, crop response should be expected, especially if applied in hot, humid conditions. Crop responses can include rolled leaves, lodging, and brittle stems. Grain sorghum is most tolerant of 2,4-D applications when it is 5 to 10 inches tall. Drop nozzles should be used when applying 2,4-D to grain sorghum greater than 8 inches. To reduce crop response, apply lower rates (2/3 pint) with atrazine, Aim, bromoxynil, or Huskie. Using crop oil in tank mixes with 2,4-D, will increase crop injury.

**Dicamba**, at the rates used in grain sorghum (0.5 pint), may be less effective on Palmer amaranth than 2,4-D. It can be applied to grain sorghum between 2 and 15 inches. Drop nozzles should be used if grain sorghum is 8 inches or taller to avoid damaging seed heads. Crop response, including rolled leaves and lodging should be expected, especially if applied in hot, humid conditions. Dicamba can be tank-mixed with Aim, atrazine, and bromoxynil.

**Bromoxynil** can be applied from the 3-leaf stage through boot stage. Crop response will be less with bromoxynil than other herbicides, but bromoxynil alone will not control Palmer amaranth larger than 4-leaf. Adequate spray coverage is needed for maximum effectiveness.

**Huskie** (pyrasulfutole+bromoxynil) is most effective when mixed with atrazine (up to 1 pound). When used alone, it can be applied between 3-leaf and 30 inches and should be applied with HSOC (high surfactant oil concentrate) or AMS + NIS. Huskie will cause leaf burn, which can be greater in fields where mesotrione was applied pre-emergence. Huskie plus atrazine may be tank-mixed with phenoxy broadleaf herbicides such as 2,4-D or dicamba as needed.

Additional information can be found in the *2022 Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland, K-State publication SRP-1169* - https://bookstore.ksre.ksu.edu/pubs/SRP1169.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.*

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## 2. High temperatures reduce effectiveness of Group 27 herbicides

As the calendar moves through the summer months and postemergence herbicides are applied to late-planted crops, it's a good time to review some research on the effects of high temperatures on Group 27 herbicides. Research conducted a few years ago, led by Drs. Mithila Jugulam and Curt Thompson, focused on Palmer amaranth control by mesotrione (Callisto, others). However, the results they reported may explain some poor control being observed following recent applications of Group 27 herbicides like topramezone (Impact, others) or pyrasulfotole (Huskie, others) in populations that are believed to be susceptible to Group 27 herbicides.

The results of the research (Figure 1) show that when Callisto was applied at 'low' temperatures (77 degrees F daytime high and 59 degrees nighttime low, far left panel of Figure 1), Palmer amaranth was controlled by the lowest herbicide rate included in the study (about 0.75 fl oz/A). However, when Callisto was applied at 'high' temperatures (104 degrees F daytime high and 86 degrees nighttime low, far right panel of Figure 1), Palmer amaranth was not controlled by the highest rate of Callisto used in the study (3 fl oz/A). These application rates do not necessarily agree with field use rates, because lower herbicide rates are often used in greenhouse or growth chamber studies such as these to account for more 'tender' plants that are controlled more easily than plants grown in field conditions.

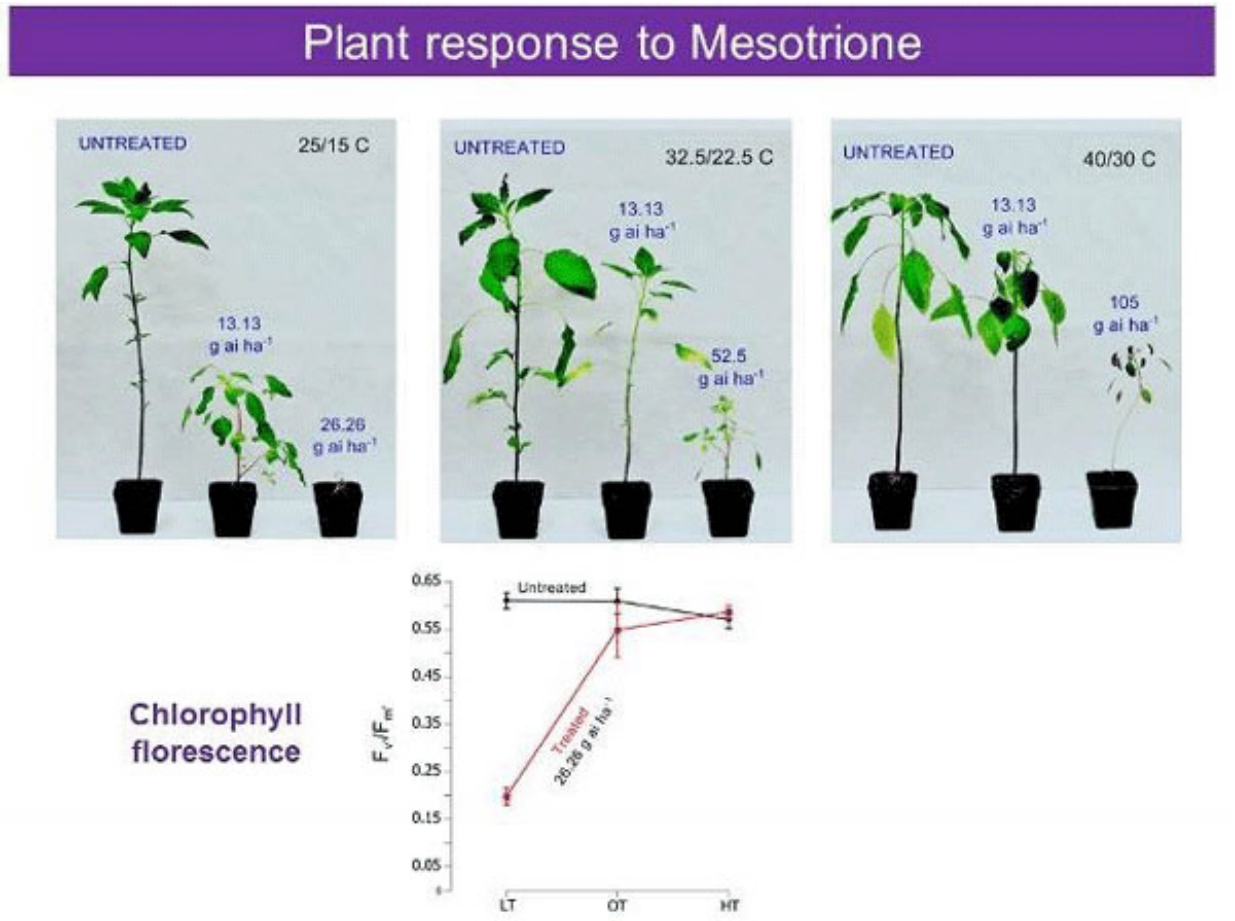


**Figure 1. Mesotrione is more effective when applied under cooler temperatures (photo on left).**

**Source: Mithila Jugulam, K-State Research and Extension.**

The research described two key changes in Palmer amaranth that cause reduced control. First, Palmer amaranth metabolized mesotrione faster at higher temperatures. This means the herbicide gets degraded faster when temperatures are high, making the herbicide less effective. Second, the HPPD enzyme, which is the target site for Group 27 herbicides, had increased activity at high temperatures, making it easier for the plant to overcome the effects of mesotrione.

For maximum effectiveness, Group 27 herbicides should be applied under the coolest conditions possible. It is very likely that other pigweed species such as waterhemp and other Group 27 herbicides, including tembotrione (Laudis), tolpyralate (Shieldex), topramezone (Impact), Balance Flexx (isoxaflutole), and pyrasulfatole (Huskie) will react the same way as Palmer amaranth to mesotrione.

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## 3. Weather averages and extremes in Kansas for the first half of 2022

In this article we take a look back at the temperature and precipitations averages and extremes across Kansas for the first six months of 2022. We evaluated both temperature and precipitation and how they compared to normal at 20 selected Mesonet locations around Kansas. This site selection should allow our in-state readers to find data for a site close to them. References to normal in these tables are based on 1991-2020 averages at each location.

**Temperature summary**

When evaluating temperatures compared to normal for the first half of 2022, there's a mixed bag of results (Table 1). A majority of Kansas stations (70%) are running below normal for the year to date. The year-to-date anomalies are generally less than 1 degree, so most of these sites have had near normal temperatures. But, as is the case every year, there are extremes of hot and cold. A period of hot weather in mid-June brought triple-digit highs to most locations, and the hottest readings of 2022 reflect that. Only Hiawatha had its highest temperature reading in May; every other location's high occurred in June. This isn't unexpected though, as meteorological summer should be the hottest time of the year. The first week of January featured below zero temperatures for most locations, but Topeka and Pittsburg's coldest readings of the year occurred in late February.

**Table 1. Temperature statistics for Kansas from January through June 2022 (average, departure, and extremes). Blue-shaded cells indicate below average; red-shaded cells indicate above average.**

| Station | Avg. Temp. (°F) | Dep. from Normal | Highest Temp. (°F) | Date | Lowest Temp. (°F) | Date |
|---|---|---|---|---|---|---|
| Ashland | 52.2 | +0.1 | 106 | 24-Jun | -3 | 2-Jan |
| Chanute | 53.9 | +1.4 | 101 | 25-Jun | 2 | 21-Jan |
| Coffeyville | 54.1 | -0.4 | 100 | 14-Jun | 4 | 20-Jan |
| Dodge City | 51.1 | -0.2 | 106 | 24-Jun | -6 | 2-Jan |
| Emporia | 52.1 | +0.6 | 97 | 22-Jun | 3 | 3-Jan |
| Garden City | 49.6 | -0.7 | 104 | 30-Jun | -7 | 2-Jan |
| Goodland | 46.7 | -0.6 | 103 | 13-Jun | -10 | 2-Jan |
| Great Bend | 50.6 | -1.5 | 105 | 17-Jun | -8 | 2-Jan |
| Hiawatha | 46.3 | -1.4 | 96 | 11-May | -6 | 2-Jan |
| Hill City | 50.0 | +0.5 | 108 | 13-Jun | -10 | 2-Jan |
| Hutchinson | 51.1 | -0.7 | 103 | 13-Jun | -3 | 2-Jan |
| Liberal | 52.2 | -0.1 | 108 | 13-Jun | -6 | 2-Jan |
| Manhattan | 49.1 | -1.6 | 100 | 14-Jun | -4 | 2-Jan |
| Olathe | 51.1 | +0.2 | 97 | 22-Jun | 3 | 3-Jan |
| Pittsburg | 51.8 | -2.3 | 98 | 17-Jun | 7 | 22-Feb |
| Russell | 50.1 | -0.3 | 103 | 13-Jun | -11 | 2-Jan |
| Salina | 51.4 | -0.6 | 103 | 13-Jun | -3 | 2-Jan |
| Topeka | 51.6 | +0.4 | 100 | 14-Jun | 0 | 23-Feb |
| Tribune | 46.0 | -2.1 | 103 | 13-Jun | -8 | 2-Jan |
| Wichita | 52.7 | -0.4 | 100 | 14-Jun | 2 | 21-Jan |

Another way to view departures is by month. This helps break down trends in temperatures thus far in 2022 (Table 2). The first quarter of 2022 resulted in below normal temperatures for all three months at all but three locations. Of those three months, February had the largest negative anomalies, as all sites were below normal for the month. There was a noticeable change in the second quarter, as there are mostly positive anomalies. June's hot spell resulted in the largest positive anomalies of the year at just over half the sites. Interestingly, all six months at Hiawatha and Tribune have been below normal, where both Chanute and Emporia have had above normal temperatures every month except February.

**Table 2. Average temperature departures (°F) from normal by month in 2022. Blue-shaded cells indicate below average; red-shaded cells indicate above average.**

| Station | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| | Departure from normal (°F) | | | | | |
| Ashland | -1.3 | -4.1 | -1.3 | +2.3 | +1.3 | +1.7 |
| Chanute | +1.2 | -1.8 | +0.6 | +1.2 | +2.3 | +3.3 |
| Coffeyville | -1.1 | -2.5 | -1.1 | -0.6 | +0.7 | +1.6 |
| Dodge City | -1.5 | -3.3 | -1.5 | +1.5 | +0.8 | +2.8 |
| Emporia | +0.8 | -2.2 | +0.4 | +0.8 | +1.6 | +2.1 |
| Garden City | -1.8 | -4.1 | -2.0 | +1.2 | +0.4 | +1.7 |
| Goodland | -0.5 | -3.4 | -2.8 | -0.2 | +0.4 | +2.5 |
| Great Bend | -2.4 | -4.3 | -2.8 | -0.7 | -0.1 | +0.8 |
| Hiawatha | -2.2 | -1.5 | -2.3 | -4.2 | -0.4 | -0.8 |
| Hill City | -0.8 | -0.8 | -1.2 | +1.8 | +0.9 | +2.8 |
| Hutchinson | -1.2 | -3.5 | -1.2 | +0.2 | +0.6 | +0.3 |
| Liberal | -1.1 | -4.9 | -1.8 | +2.5 | +2.2 | +2.3 |
| Manhattan | -2.6 | -3.4 | -1.9 | -2.3 | +0.3 | +0.4 |
| Olathe | -0.2 | -2.3 | -0.2 | -0.7 | +1.3 | +2.6 |
| Pittsburg | -2.4 | -5.2 | -2.1 | -3.1 | -1.0 | +0.4 |
| Russell | -1.2 | -1.8 | -1.7 | +1.5 | +0.6 | +0.7 |
| Salina | -0.8 | -3.0 | -1.8 | +0.2 | +1.3 | +0.7 |
| Topeka | +0.5 | -2.7 | -0.5 | +0.0 | +2.2 | +2.4 |
| Tribune | -2.9 | -4.7 | -3.5 | -0.6 | -0.3 | -0.4 |
| Wichita | -0.4 | -4.7 | -0.6 | +1.2 | +0.9 | +0.9 |

**Precipitation summary**

Early 2022 rainfall trends focused on negative precipitation anomalies for almost two-thirds of the state. Most noteworthy is the lack of precipitation in the west (Table 3). Garden City has received only 1.60" of precipitation for the year-to-date, just 18% of normal. Dodge City, Liberal, and Tribune are all at or below 50% of normal. There are some lucky locations that have positive precipitation anomalies; Wichita is 5.59" above normal for the year, thanks to nearly 13" of rain in May. May and June were the wettest months at all stations, which is normal for most locations in Kansas.

**Table 3. Observed and normal precipitation in Kansas for January - June 2022. Green-shaded cells indicate above-normal/greater than 100%. Yellow-shaded cells indicate below-normal/less than 100%)**

| Station | Actual Precipitation (in.) | Normal Precipitation (in.) | Departure from Normal | Percent of Normal (%) |
|---|---|---|---|---|
| Ashland | 6.73 | 11.74 | -5.01 | 57 |
| Chanute | 19.03 | 20.85 | -1.82 | 91 |
| Coffeyville | 18.38 | 22.23 | -3.85 | 83 |
| Dodge City | 4.73 | 10.81 | -6.08 | 44 |
| Emporia | 19.64 | 17.66 | +1.98 | 111 |
| Garden City | 1.60 | 9.09 | -7.49 | 18 |
| Goodland | 6.21 | 9.11 | -2.90 | 68 |
| Great Bend | 7.84 | 13.59 | -5.75 | 58 |
| Hiawatha | 21.13 | 17.05 | +4.08 | 124 |
| Hill City | 6.18 | 10.40 | -4.22 | 59 |
| Hutchinson | 13.71 | 15.05 | -1.34 | 91 |
| Liberal | 4.45 | 9.49 | -5.04 | 47 |
| Manhattan | 20.33 | 18.02 | +2.31 | 113 |
| Olathe | 19.78 | 19.37 | +0.41 | 102 |
| Pittsburg | 20.93 | 25.89 | -4.96 | 81 |
| Russell | 9.35 | 12.20 | -2.85 | 77 |
| Salina | 15.43 | 15.18 | +0.25 | 102 |
| Topeka | 19.93 | 18.31 | +1.62 | 109 |
| Tribune | 4.33 | 8.60 | -4.27 | 50 |
| Wichita | 23.10 | 17.51 | +5.59 | 132 |

A closer look at the percentage of normal precipitation by month better illustrates how drought conditions have worsened across the western half of Kansas, with consecutive months of below normal precipitation. Ashland, Dodge City, Garden City, Great Bend and Liberal have not had a month with above-normal precipitation this year. The highest percent of normal in Garden City this year is only 29%, which explains why they are nearly 7.5" below normal for the year. February and April were below normal at all 20 stations. Beneficial rainfall fell in eastern Kansas in May, with 13 of the 20 sites reporting above-normal precipitation, but the western locations missed out on the best moisture. Only three stations had above normal rainfall in June. Keep in mind that precipitation percentages below 100 indicate greater rainfall deficits in the later months when more precipitation is typically observed.

**Table 4. Percent of normal precipitation by month for January-June 2022. Green-shaded cells indicate over 100%.**

| Station | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| | % normal precipitation | | | | | |
| Ashland | 12 | 12 | 64 | 37 | 59 | 78 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Chanute | 5 | 69 | 139 | 43 | 154 | 67 |
| Coffeyville | 4 | 52 | 75 | 54 | 132 | 82 |
| Dodge City | 87 | 56 | 64 | 28 | 43 | 36 |
| Emporia | 19 | 9 | 175 | 20 | 186 | 123 |
| Garden City | 13 | 0 | 11 | 8 | 29 | 18 |
| Goodland | 251 | 58 | 93 | 2 | 104 | 46 |
| Great Bend | 7 | 7 | 78 | 16 | 79 | 71 |
| Hiawatha | 147 | 8 | 130 | 71 | 123 | 193 |
| Hill City | 186 | 14 | 76 | 16 | 81 | 58 |
| Hutchinson | 29 | 26 | 109 | 22 | 158 | 77 |
| Liberal | 9 | 3 | 31 | 69 | 32 | 63 |
| Manhattan | 31 | 13 | 140 | 31 | 169 | 128 |
| Olathe | 18 | 9 | 199 | 81 | 200 | 22 |
| Pittsburg | 41 | 73 | 83 | 58 | 134 | 51 |
| Russell | 15 | 0 | 134 | 16 | 107 | 83 |
| Salina | 48 | 18 | 100 | 23 | 179 | 97 |
| Topeka | 59 | 62 | 158 | 29 | 226 | 46 |
| Tribune | 140 | 98 | 72 | 16 | 75 | 21 |
| Wichita | 12 | 73 | 178 | 25 | 251 | 88 |

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## 4. Kansas River Valley Experiment Field Fall Field Day, August 9

All interested individuals are invited to attend the **2022 Kansas River Valley Experiment Field Day** on **Tuesday, August 9, at 5:00 p.m**. The event will be held at the Rossville Experiment Field (1 mile east of Rossville on Hwy 24, south side of the road).

This is a free event and pre-registration is requested for the catered BBQ meal. To pre-register for this event and for the catered BBQ meal sponsored by Wilbur-Ellis, call Kaci Beck at the Shawnee County Extension Office at 785-232-0062, ext. 100, by 5:00 p.m., Monday, August 8. Commercial pesticide applicator credits have been approved.

Topics and speakers:

**Getting the most out of your N and P fertilizer dollars** – Brian Rutter, Soil Fertility PhD student with Dr. Dorivar Ruiz Diaz

**Strategies to manage pigweeds with cover crops**– Lily Woitaszewski, Weed Management graduate student with Dr. Sarah Lancaster

**Sniffing out shifting weather patterns** – Chip Redmond, Kansas Mesonet

*Kansas State Research & Extension*
*KSU Agronomy*

# Kansas River Valley Experiment Field
# 2022 Fall Field Day

## Tuesday, August 9 - 5:00 p.m. Sharp!

**Rossville Field** — 1 Mile East of Rossville
On U.S. Highway 24 on the South Side of the Road

**Getting the Most Out of Your N and P Fertilizer Dollars**
Brian Rutter (soil fertility PhD student with Dr. Ruiz Diaz)

**Strategies to Manage Pigweeds with Cover Crops**
*Lily Woitaszewski (weed management MS student with Dr. Lancaster)*

**Sniffing Out the Shifting Weather Patterns**
*Chip Redmond (assistant meteorologist-KSU Mesonet)*

To pre-register for this event and for the catered BBQ meal sponsored by Wilbur-Ellis, call Kaci Beck at the Shawnee County Extension Office at 785-232-0062 ext 100, by 5:00 p.m. on Monday, August 8.

**Commercial Pesticide Applicator Credits have been approved.**

## 5. K-State East Central Experiment Field Fall Field Day, August 17

All interested individuals are invited to attend the **2022 East Central Experiment Field Day** on **Wednesday, August 17, at 9:00 a.m**. The event will be held at the Ottawa Experiment Field (From I-35 at Ottawa proceed south 1.7 miles on 59 Hwy, go east 1 mile, and south 0.75 mile).

This is a free event and no pre-registration is required. Registration will begin at 9 am with coffee and doughnuts provided. The program will start at 9:30 am. There will be a lunch at noon after the conclusion of the program. Commercial pesticide applicator credits have been approved.

Topics and speakers:

**Adjusting weed management strategies for soybean planting date** – Dr. Sarah Lancaster and Tyler Meyeres

**Getting the most out of your N and P Fertilizer dollars** – Dr. Dorivar Ruiz Diaz

**Sniffing out the shifting weather patterns –** Chip Redmond, Kansas Mesonet

**How do fungicides fit into wheat management in eastern Kansas?** – Dr. Kelsey Andersen Onofre

Please contact the East-Central Research Station at 785-242-5616 at least two days prior to this event if accommodations are needed for persons with disabilities or special requirements.

*Kansas State Research & Extension*

# KSU Agronomy Ottawa Field Day

## Wednesday, August 17th, 2022

**East-Central Experiment Field**

**Ottawa, KS**

**From I-35 at Ottawa: South 1.7 miles on 59 Hwy, East 1.0 mile, South 0.75 mile**

**9:00 .....Registration, coffee, and doughnuts**

**9:30 .....Program begins**

**Adjusting Weed Management Strategies for Soybean Planting Date**
*Dr. Sarah Lancaster, and Tyler Meyeres*

**Getting the Most Out of Your N and P Fertilizer Dollars**
*Dr. Dorivar Ruiz Diaz, soil fertility specialist*

**Sniffing Out the Shifting Weather Patterns**
*Chip Redmond (assistant meteorologist-KSU Mesonet)*

**How do Fungicides Fit into Wheat Management in Eastern Kansas**
*Dr. Kelsey Andersen Onofre*

**12:00 .....Lunch**

**Commercial Pesticide Applicator Credits have approved. Please contact the East-Central Research Station at 785-242-5616 at least two days prior to this event if accommodations are needed for persons with disabilities or special requirements.**

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