University of Kentucky
College of Agriculture, Food and Environment
Cooperative Extension Service

Wheat Science News

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**Wheat Field Day — May 9*

**Corn-Soybean-Tobacco Field Day— July 27*

Warm Weather Results in Advanced Winter Wheat Growth Stages in KY

Dr. Carrie Knott — Extension Agronomist, Princeton
Dr. Lloyd Murdock—Emeritus Extension Soil Specialist, Princeton
Dr. Edwin Ritchey—Extension Soil Specialist, Princeton

Unseasonably warm temperatures in KY since wheat planting (October 15, 2016) may become a major challenge to wheat yield and profitability this year. Since Oct 15, 2016, KY has accumulated about 2000 GDD growing degree days (GDD) or heat units. In most years, only about 1500 GDD are accumulated by mid-February, while 2000 GDD are typically accumulated around the end of March in KY.

Figure 1. Wheat plants at jointing (Feekes 6) growth stage.

These extraordinarily warm days and large number of GDD have resulted in wheat crops that are at a more advanced growth stage for this time of year. Typically, most of KY wheat in mid-February is beginning to break dormancy and initiate active growth: Feekes 3, Green-up. However, there are several reports in KY that wheat is jointing (Feekes 6; Figures 1 & 2). This is very concerning because at jointing (Feekes 6) the growing point (developing wheat head) is above the soil surface and is vulnerable to damage, including freeze damage. The risk of freeze damage is quite high because throughout KY there is still at least a 6 to 9 week window that a freeze typically occurs (Table 1).

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LEXINGTON, KY 40546

Disabilities accommodated with prior notification.

Considerations:

- For wheat crops that have not received any nitrogen, consider a single nitrogen application as late as Feekes 6 or 7 growth stage. Delaying nitrogen application may reduce plant growth and the risk of freeze damage.
  - ◊ Research in KY has shown that with sufficient tillers, nitrogen application can be delayed as late as Feekes 6 or 7 with little or no yield reduction.
  - ◊ Normally nitrogen is applied by Feekes 5 or 6 to maximize yield. With the accelerated growth this year, delaying nitrogen application until Feekes 6 or 7 could retard wheat development and provide additional freeze protection, depending on when a freeze occurs.
  - ◊ Yield will be reduced if nitrogen application is delayed beyond Feekes 7, such as delays due to weather or field conditions.
- For wheat crops at jointing, Feekes 6, that have already received nitrogen applications, there is nothing that will protect the crop from freeze damage. The best approach is to consider delaying the second nitrogen application until Feekes 6 or 7, potentially reducing the severity of freeze damage.
- Freeze injury occurs when temperatures fall to 24°F or below for 2 or more hours at the jointing growth stage: Feekes 6.
- If freezing temperatures remain above 24°F there is only a slight risk of freeze damage.
- In Western KY, the wheat crop does not appear to be as advanced as other areas of the state. Last fall there was a considerable drought that may have resulted in 'dormant' wheat in the fall (due to lack of water) when other areas of the state wheat was actively growing. These areas will likely be most profitable following 'normal' wheat management recommendations.
- Be prepared to scout fields much earlier than usual for insects and plant diseases. The warm winter temperatures have also resulted in greater insect populations in KY, specifically cereal aphid species, which may increase the incidence of barley yellow dwarf virus.

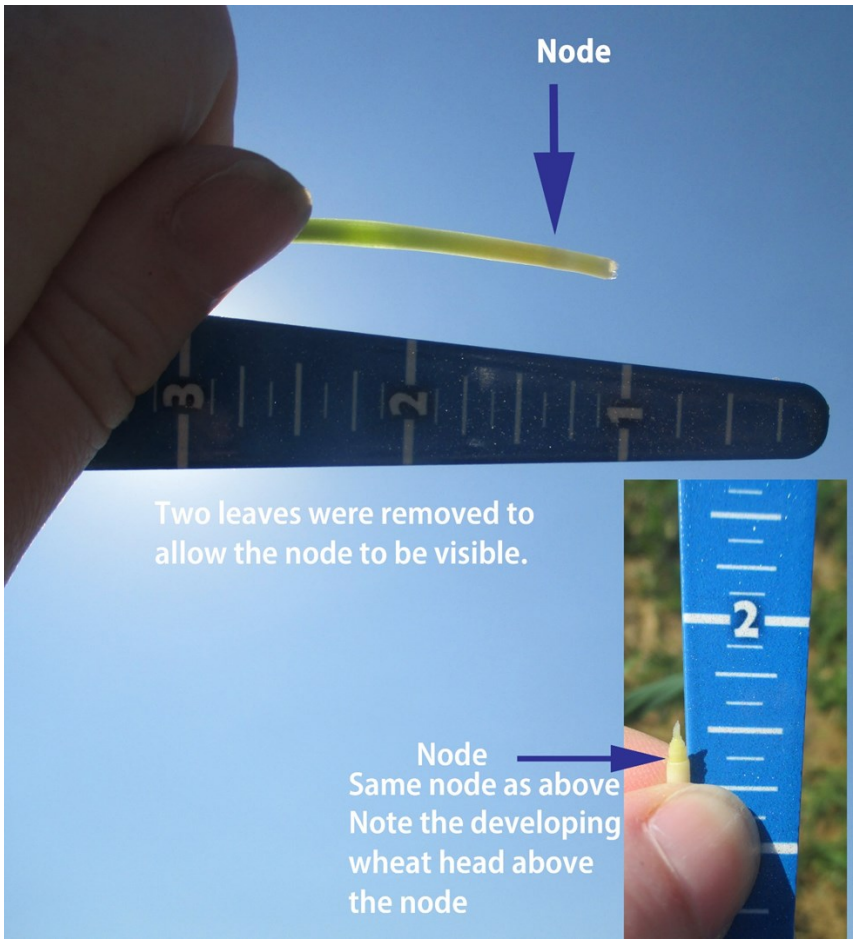
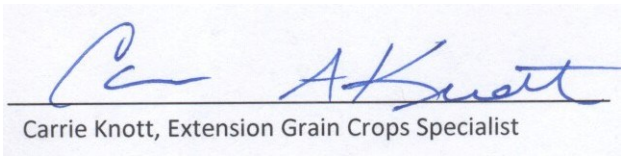


Figure 2. Wheat plant at jointing (Feekes 6) growth stage.

Table 1. Probabilities for the date of the last spring freeze (32°F) in Kentucky based upon data from 1981 to 2010 (Arguez et al., 2010 provided by S. Foster, State Climatologist for Kentucky). Probabilities that the last spring freeze will occur on or after the date listed. For example, for 90% probability the last spring freeze will occur on or later than the date listed 90% of the time (nine out of ten years), while at the 10% probability level the last spring freeze will occur on or later than the dates listed 10% of the time (one out of ten years).

Kentucky Location	Date of Last Spring Freeze (32°F or less) in Kentucky by Probability Level		
	90%	50%	10%
Ashland	6-Apr	24-Apr	10-May
Bardstown	30-Mar	14-Apr	29-Apr
Bowling Green	25-Mar	9-Apr	25-Apr
Covington	2-Apr	16-Apr	2-May
Danville	27-Mar	11-Apr	27-Apr
Glasgow	29-Mar	13-Apr	27-Apr
Henderson	24-Mar	8-Apr	23-Apr
Hopkinsville	24-Mar	10-Apr	24-Apr
Leitchfield	14-Apr	28-Apr	15-May
Lexington	29-Mar	14-Apr	29-Apr
Mayfield	23-Mar	9-Apr	23-Apr
Monticello	3-Apr	20-Apr	5-May
Murray	17-Mar	2-Apr	18-Apr
Nolan River Lake	3-Apr	20-Apr	7-May
Princeton	29-Mar	13-Apr	29-Apr
Russellville	25-Mar	11-Apr	29-Apr
Shelbyville	16-Apr	29-Apr	14-May
Somerset	3-Apr	20-Apr	6-May



Carrie Knott, Extension Grain Crops Specialist

Risk of Stripe Rust of Wheat in 2017 is on the Rise for Kentucky Farmers

Dr. Carl Bradley — Extension Plant Pathologist, Princeton

Stripe rust, caused by the fungus *Puccinia striiformis*, was fairly prevalent in Kentucky wheat fields in 2016, and will likely make an appearance again in 2017. In general, the stripe rust fungus generally doesn't survive Kentucky winters, but it can move into Kentucky during the growing season from states south of Kentucky. During February 2017, stripe rust had already been observed in states like Mississippi and Arkansas, which is an indication that the disease is headed northward. A major pathway in which the stripe rust fungus' spores move northward is the Mississippi River Valley, so once the disease is in states like Mississippi and Arkansas, it is only a matter of time before it arrives in Kentucky.

Fortunately, many wheat varieties are resistant to stripe rust. For resistant varieties, no additional management will be needed. In addition to checking with the seed company about how resistant a specific wheat variety may be, this information may also be obtained by looking at the results of the 2016 University of Kentucky Wheat Variety Performance Trials (http://www.uky.edu/Ag/wheatvarietytest/). If a variety is susceptible to stripe rust, a foliar fungicide application may be needed. Most fungicide products available for wheat will provide a satisfactory level of control of stripe rust as long as they are applied before stripe rust gets to damaging levels. An application of a foliar fungicide when flag leaves have emerged, will help protect the most important leaf on a wheat plant and protect against yield losses. Keep in mind that an application of a fungicide at the flag leaf emergence stage will not provide protection against Fusarium head blight (scab), and that an additional fungicide application may be needed later in the season (during the wheat flowering stage) to help protect against scab.

Stripe rust pustules on a wheat leaf (photo by Dr. Carl Bradley).

Wheat: Earlier Aphid Occurrences May Be a Consequence of 2017's Warm Winter

Dr. Raul Villanueva — Extension Entomologist, Princeton

In Kentucky there is a complex of aphid species that feeds on wheat. The bird cherry oat, the English grain (Fig.1), the greenbug, and the corn aphids are the most important species. Their role as vectors of plant viruses, particularly Barley Yellow Dwarf Virus (BYDV), branded them as the key pest on wheat grain production. These aphid species overwinter as nymphs, and can be active when temperatures are above 45° F. It is known that BYDV infections are more damaging when they occur in early growth stages of the wheat plant. Thus, aphids have more opportunities to infect young plants under this climatological circumstances.

Figure 1. Pictures of the bird cherry oat aphid and a winged English grain aphid found in wheat fields in February 2017. (Photo credits Yaziri Gonzales).

Also, uncharacteristically warm temperatures (above 50° F) were present during most days of November (Fig. 2). Based on historical records and comparing mean temperatures for the bimonthly periods November–December 1976, 1996, and 2016; and January-February 1977, 1997 and 2017 (periods were separate to facilitate the analysis). We can notice that mean temperatures (linear regression analysis) for 2016 and 2017 were higher than the previous year for the same periods, respectively (Fig. 2). It may be possible that the continuous alterations on the climatological events are influencing these warmer temperatures (more frequent rains, storms out of the normal patterns, sudden ice storms, etc.) as shown on these 20-year intervals.

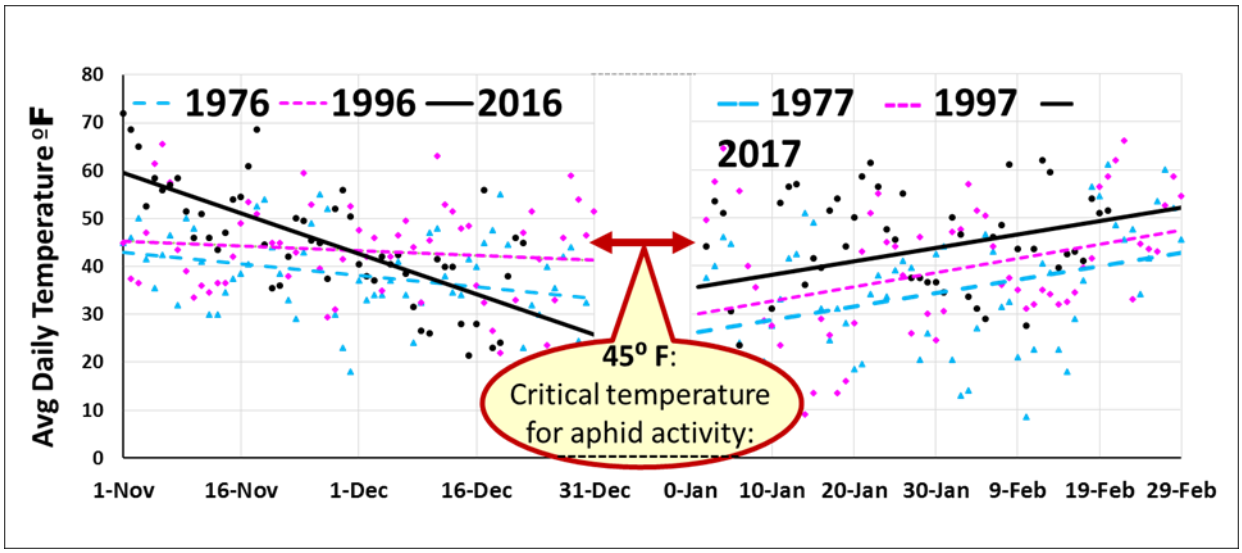


Figure 2. Temperatures (40° F) for the months of November-December 1976, 1996, and 2016; and January-February 1977, 1997, and 2017. Regression lines shown that temperatures for 2016 and 2017 were higher than for the previous years. (Figure was generated with temperatures of of Princeton, KY obtained from: http://weather.uky.edu/ky/data.php#KY_Monthly_Data).

Given the circumstances mentioned above, the warm winter in all likelihood will accelerate the development of both plants, and insects. To predict the biological events of organisms, accumulated degree days (AcDD) is used. The DD is based on temperatures above threshold temperatures that are specific for each organism. For wheat and aphids these are 45° and 40° F, respectively. These biological events are in turn used to schedule particular activities such as scouting and synchronizing insecticide sprays. For aphids and wheat, the AcDD starts on January 1 2017. Table 1 shows the AcDD for wheat and aphids from 2011 to 2017 for three counties of Kentucky. AcDD for 2017 are ahead of the AcDD of previous years.

Table 1. Accumulated degree days for wheat and aphid species for Caldwell, Monroe and Fayette Counties in Kentucky from January 1 to February 20, 2011 to 2017. (Data source: http://weather.uky.edu/dd.php)

Caldwell	2011	2012	2013	2014	2015	2016	2017
Wheat (base 40° F)	178	289	271	143	146	234	394
Aphids (base 45° F)	109	182	173	84	89	150	264
Monroe	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Wheat (base 40° F)	220	330	268	192	171	241	448
Aphids (base 45° F)	141	215	174	127	103	160	307
Fayette	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Wheat (base 40° F)	135	215	196	120	108	180	321
Aphids (base 45° F)	86	125	123	71	61	113	203

For wheat, the AcDD is far ahead compared to all the previous years, and that could set up wheat fields for freeze damage later in case an eventual freeze takes place. A later freeze on March or April can also affect insects. However, Dr. Michaud (Biocontrol Specialist) from the University of Kansas declared that earlier biological control organisms such as ladybug eggs and parasitoids can be disrupted by a cold front, and their recovery can be slower compared with insect pests.

Other pests such as Hessian fly maggots that are in root system of volunteer wheat or other plants also can be a problem. They can continue feeding as long as temperatures are above 40° F. For this pest a chemical control would not work. However, for Hessian flies or BYDV there are resistant varieties that growers should have been using to reduce pest damages.

We have been sampling for aphids here at the UK's Research and Education Center and other counties (Lyon, Trigg, Christian) and no aphids were found so far. However, we found aphids in early or late when? December. No aphids were found from mid-December to mid-February. However, aphids were found in low numbers after February 15 (when temperatures were >65° F). Most of these aphids were nymphs although we had some adults and winged aphids.

A question still remains about to spray or not to spray. There are many factors to consider but the most important is the economic value of the crop. The best alternative here is to continue monitoring for the presence of aphids and if the tallies are above the threshold levels indicated in Table 2, an insecticide spray need to be considered.

Table 2. The Number of Aphids Per Foot of Wheat Row Required to Support an Insecticide Application for Management of BYD

Crop Age (days post emergence)	N° of Aphids per foot row
≤ 30 days post emergence	3
30 to 60 days post emergence	6
> 60 days post emergence	10

For more information check the following URL:

Predicting Insect Development Using Degree Days: http://entomology.ca.uky.edu/ef123

Aphids and Barley Yellow Dwarf (Byd) in Kentucky Grown Wheat:
http://www2.ca.uky.edu/entomology/entfacts/entfactpdf/ef121.pdf

Wheat Outlook and Profitability Potential

Dr. Todd Davis — Extension Ag Economist, Princeton

2016-17 Wheat Market Outlook

The February World Agricultural Supply and Demand Estimates (WASDE) report, released February 9, surprised the wheat market by increasing the projected exports by 50 million bushels to 1.025 billion bushels for the 2016-17 marketing-year. Wheat has struggled in maintaining export competitiveness with other wheat producing countries, so this increase in exports is a welcome surprise.

Table 1. U.S. Wheat Supply and Use

	2013-14	2014-15	2015-16 Estimated	2016-17 Projected	Change from 15-16
Planted Acres (million)	56.2	56.8	55.0	50.2	-4.8
Harvested Acres (million)	45.3	46.4	47.3	43.9	-3.4
Yield (bushels/acre)	47.1	43.7	43.6	52.6	+9.0
		---------- Million Bushels ----------			
Beginning Stocks	718	590	752	976	+224
Production	2,135	2,026	2,062	2,310	+248
Imports	173	149	113	125	+12
Total Supply	3,026	2,766	2,927	3,410	+483
Food	955	958	957	960	+3
Seed	77	79	67	61	-6
Feed and Residual	228	122	152	225	+73
Exports	1,176	854	775	1,025	+250
Total Use	2,436	2,014	1,952	2,271	+319
Ending Stocks	590	752	976	1,139	+163
Stocks/Use	24.2%	37.3%	50.0%	50.2%	+0.2%
Days of Stocks	88	136	183	183	+1
U.S. Marketing-Year Average Price ($/bu)	$6.87	$5.99	$4.89	$3.85	-$1.04

Source:February 2017 WASDE - USDA: WAOB.

Table 1 shows the wheat balance sheets for the 2013 through 2016 marketing-years. The wheat market has been signaling for less production and farmers responded by seeding 4.8 million fewer acres in 2016. Mother Nature provided a record yield of 52.6 bushels/acre, which offset the reduced acres and provided a wheat crop that was 248 million bushels larger than in 2015 (Table 1). When you factor in the larger carry-in from 2015-16 of 976 million bushels plus the 2.31 billion bushel wheat crop, the total supply of wheat in the marketing channel is 3.41 billion bushels up 483 million bushels from 2015.

Table 1 shows that use is not projected to keep pace with this increase in supply. USDA projects total wheat use to increase by 319 million bushels. The increase in projected wheat exports is a positive sign for the market after two years of declining wheat exports.

Ending stocks are projected to increase to 1.139 billion bushels, which is an increase of 163 million bushels from last year. The wheat market has the equivalent of a 183-day supply of wheat on hand on June 1, 2017, before the 2017 wheat crop is harvested. This volume is weighing on the market with the U.S. marketing-year average price projected at $3.85 per bushel, which is $1.04/bushel lower than last year's price (Table 1).

Wheat prices have rallied because of the forecasted 10% reduction in the winter wheat seeded area for 2017, which is reportedly the smallest winter wheat crop since 1909. An expanding dry area in the Southern Plains states combined with wheat breaking dormancy early is increasing the likelihood of weather reducing the size of the winter crop.

2017 Profitability Potential and Break-Even Prices

The profitability potential for wheat and double-crop soybeans are shown in the following table. The University of Kentucky budgets are based on wheat yields of 75 bushels/acre. Sensitivity analysis on yields is included with wheat yields at 90 and 60 bushels per acre. The double-crop soybean enterprise budget assumes a yield of 40 bushels/acre. Table 2 includes double-crop yields of 50 and 30 bushels per acre. Prices are for Western Kentucky using average cash forward contract bids for Western Kentucky wheat in June/July and for soybeans in October/November listed on DTN.

Table 2 distributes the costs in the variable costs (seed, fertilizer, pesticides, fuel/oil, repairs, etc.); fixed costs (machinery depreciation and overhead); and land cost. Wheat yields at 90 bushels or larger are projected to cover total variable and fixed costs (line 4). Wheat prices would have to $5.46 at 75 bushels/acre yield to cover variable costs, fixed costs, and land costs.

The double-crop soybean returns over inputs, fixed costs, and land are positive for soybean yields 40 bushels/acre or greater. Only the double-crop soybean yield of 30 bushels/acre is projected to have a loss over variable costs, fixed costs and land cost (Table 2).

Table 2 also shows the break-even prices needed to cover the various costs. The break-even price needed to cover total cash costs, fixed costs, plus cash rent at a wheat yield of 75 bushels/acre is $5.46/bushel. If the harvested wheat yield is 60 bushels/acre, the break-even is $6.83/bushel. This type of analysis, using your farm's costs and yield potential, is helpful in guiding marketing decisions for wheat or soybeans before harvest.

The recent rally in the wheat market is providing some pricing opportunities to lock in a return over inputs, fixed costs, and a portion of land costs. The forward contract price for wheat has increased $0.50/bushel from the December newsletter to February 22, 2017. Similarly, the soybean futures market has been offering pricing opportunities for the 2017 crop. The November 2017 soybean futures market price is expected to be pressured by another large South American crop that will start harvest this month. An unexpectedly large increase in U.S. soybean acres will add more pressure to the November 2017 soybean futures price. I encourage you to consider pricing a percentage of the 2017 wheat and soybean crops at profitable price levels.

Table 2.
Budgeted Returns for 2017 Wheat and Double-Crop Soybeans for Varying Yields

	Wheat			Double-Crop Soybeans		
Yield	90	75	60	50	40	30
Price	$4.60	$4.60	$4.60	$9.90	$9.90	$9.90
Revenue	$414	$345	$276	$495	$396	$297
Total Variable Costs	$267	$267	$267	$226	$226	$226
Return over Total Variable Costs	$147	$78	$9	$269	$170	$71
Total Fixed Costs	$55	$55	$55	$28	$28	$28
Return over Variable + Fixed Costs	$92	$23	-$46	$241	$142	$43
Land Cost	$88	$88	$88	$88	$88	$88
Return to Operator Mgt & Risk	$4	-$65	-$134	$153	$54	-$45
Break-Even Prices ($/bu.) to Cover:						
Total Variable Costs	$2.97	$3.56	$4.45	$4.51	$5.64	$7.52
Total Variable + Fixed Costs	$3.58	$4.29	$5.37	$5.07	$6.34	$8.45
Total Economic Costs	$4.55	$5.46	$6.83	$6.83	$8.54	$11.38

Source: University of Kentucky Enterprise budgets for 2017 Wheat and Double-Crop Soybeans

Don Halcomb Receives the 2017 UK Wheat Science Service Award

PHOTO: Stephen Patton, UK Agricultural Communications

The University of Kentucky Wheat Science Group recently honored Kentucky producer Don Halcomb with its first Service Award. The group created the award to recognize individuals for their partnerships with and contributions to wheat research in the UK College of Agriculture, Food and Environment. Halcomb of Schochoh in Logan County has advocated for research that will improve Kentucky wheat operations and set the state up as a national leader in innovative wheat production. He has been a partner with UK's Wheat Science Group since its formation and has been the driving force behind many UK research projects.

Lloyd Murdock, UK extension soils scientist, has worked with Halcomb since the 1980s on numerous wheat-related research projects looking at effects of nitrogen on the crop. It was their work and leadership that helped no-till wheat become an accepted practice – first among Kentucky growers and later adopted by growers in other states. "Don is a great thinker and a great reader and a great listener," Murdock said. "He always seems to be on the cutting edge of what is needed in order to take the next step forward in Kentucky agriculture. I have never seen him do any of this for his own benefit."

Halcomb has partnered with group members on various research projects, including two decades of continuous wheat breeding and variety trials. He has also hosted many wheat and small grain field days in conjunction with college researchers. "At the end of a long meeting when everyone else has run out of steam, he will ask a question that just stops everyone in their tracks, because it is so perceptive," said David Van Sanford, UK wheat breeder. "Without a doubt he makes all of us around him better by keeping us on our toes and inspiring us to think more deeply. He has been a great friend to the Wheat Science Group and has made us better at what we do."

Halcomb believes the partnership between Kentucky wheat producers and the UK Wheat Science Group has been a win-win for all. "I feel like the wheat growers in Kentucky have made huge progress in the last 25 years, and UK researchers have been a big part of that," he said.

By Katie Pratt—UK Ag Communications

CONGRATULATIONS!

Mark Your Calendar - More Details Coming!

Register for THE UK WHEAT PRODUCTION FIELD SCHOOL: Hands-On Training

GREEN- UP - March 8th **PRIOR TO FLOWERING - April 26th** **PRE-PLANT – Fall '17**

The UK Wheat Science Group with support from the Kentucky Small Grain Growers' Association will offer three hands-on training sessions on managing wheat in Kentucky. These trainings are directed towards crop advisors and farm managers who provide agronomic guidance for wheat production. The sessions will be held on the UKREC Farm (1205 Hopkinsville Street in Princeton, KY) from 9am - 3:00pm CST (Lunch is included). Class size is limited to 30 people per training.

PRE-REGISTRATION IS REQUIRED - The cost is $60/session –
To sign up please go to: http://wheatscience.ca.uky.edu/ and click on desired session.

GREEN-UP - March 8th

Pesticide Credits: 3 General Hours & 1 Specific Hours (Cat 1A, 10, 12)
CCA Credits: 2.5 SW, 1 PM, 2.5 CM

TOPICS
- Submitting samples to UK diagnostic lab - Brenda Kennedy
- Relating soil productivity to soil types - Jerry McIntosh (NRCS)
- Growth stage / plant dissection at green-up - Carrie Knott
- Assessing freeze damage - Carrie Knott
- Planting date and seeding rate differences impact tiller counts - Carrie Knott
- Herbicide symptomology associated with injury from tank contamination, application timing, etc. - Jim Martin
- Nitrogen management - Edwin Ritchey & John Grove
- Tillage and traffic impacts on establishing wheat stands – John Grove & Edwin Ritchey
- Impact of rooting depth of ryegrass on productivity of certain soils - Lloyd Murdock
- Weed Identification - Jim Martin

PRIOR TO FLOWERING (April 26th)

- Growth stage / plant dissection near heading - Carrie Knott
- Planting date and seeding rate differences impact stem counts near heading - Carrie Knott
- Growth regulators for wheat - Carrie Knott
- Application timing of fungicides - Carl Bradley
- Late nitrogen applications for protein - John Grove
- Plant analysis for assessing nutrition - John Grove
- Tillage and traffic impacts on growth - John Grove & Edwin Ritchey
- Managing insects during grain storage - Raul Villanueva
- Controlling ryegrass as a cover crop and as a weed in wheat - Lloyd Murdock & Jim Martin
- Weed Identification - Jim Martin

For more information or if you have any issues or questions with registration, please contact:
Dr. Edwin Ritchey: 270-365-7541 ext. 301 or Kelsey Mehl: 270-365-7541 ext. 200.

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RETURN SERVICE REQUESTED

Wheat Production Field School: A Hands-On Training

Dates: March 8, 2017 (Green-Up) &

April 26, 2017 (Prior to Wheat Heading)

Wheat Field Day—May 9, 2017—UKREC Princeton

Corn-Soybean-Tobacco Field Day—July 27, 2017