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

Wheat Science

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What's inside

Nitrogen Management for Wheat in 2019

Dr. Edwin Ritchey — Extension Soils Specialist

Nitrogen (N) management for the 2019 wheat crop may differ from recent years for some producers. The current appearance of the 2019 wheat crop is basically determined by planting date. Wheat planted before the end of October generally looked pretty good going into winter. However, later planting dates that struggled with emergence and growth prior to cold and wet weather don't have the same growth and overall appearance. Many years, wheat planted at the end of October or beginning of November will have adequate growth before the arrival of winter, but not this year.

Producers that split apply N should be getting ready to consider the first application when the weather breaks and growing conditions warrant. Research shows a yield advantage for split applied N (Feekes 2-3 and at Feekes 5-6) over a single N application (Feekes 4-5). The first application at Feekes 2-3 typically occurs between mid-February to early March, depending on environmental conditions. The N rates used should be based on tiller counts and overall stand appearance. Nitrogen rates for the first application are generally recommended between 30 to 50 lb N/A as determined by tiller counts. Tiller counts above 70 tillers per square foot would receive the lower N rate and the higher N rate would benefit wheat with tiller counts less than 70 per square foot.

Some late planted wheat is currently very small and has a very small root system. Smaller root systems might not be capable of taking up the same amount of nutrients as larger plants. One caveat to N fertilization by tiller counts is due to this very small wheat and subsequent root systems. It might benefit producers with very small wheat to apply the lower end of the recommended N rate so that wheat can utilize the applied N and benefit, but not leaving excess N available for losses. Once the wheat utilizes that N and grows, the remainder of the total N rate can be adjusted with the second N application at Feekes 5-6.

A short stint of unseasonably warm weather may have encouraged some wheat growth the last few days. Wheat will likely utilize the majority of the N applied by those producers that made their first application recently. The weather is predicted to turn cold again, stopping wheat growth and nutrient uptake. The remaining N not utilized by the wheat during this time will be subjected to N loss mechanisms such as denitrification and leaching.

Adequate N rates do encourage tillering, but excessive N rates make the plant more susceptible to lodging, diseases, and freeze damage. Proximal crop canopy sensors such as Greenseeker detect a combination of plant biomass and crop "greenness". There is not enough biomass present at the first application to adequately sense greenness and is not recommended to make the first N application.

Timely planted wheat typically grew off well in the fall and went into the winter in pretty good shape, while late planted wheat is further behind. Nitrogen recommendations should be based on overall vigor and tiller counts at Feekes 2-3 if making a split N application. For more information, please consult AGR-1: Lime and Fertilizer Recommendations, ID-125: A Comprehensive Guide to Wheat Management in Kentucky, or your local county agricultural extension agent.

Assessing the Spring 2019 Kentucky Winter Wheat Condition

Dr. Carrie Knott— Extension Grain Crops Specialist

Most of Kentucky is reeling from the "unusual" weather conditions we have had since last fall. In general, the fall was much cooler and wetter for much of Kentucky than the 30-year averages would have predicted. There have also been periods of >60°F temperatures, such as Christmas and this past week, which are not all that unusual for Kentucky. However, the temperature swing from 4°F to 60°F in just a couple of days this past week is a bit unusual.

These conditions have resulted in many wheat fields that were planted "early" this fall to be the fields with "adequate" growth (Figure 1). And unfortunately, the fields that were planted "on time", i.e. within the University of Kentucky's recommended planting window, to be developmentally delayed (Figure 2). In addition, the considerable precipitation, cool temperatures, and limited sunlight this winter have resulted in many wheat fields with considerable yellowing (Figure 3), reduced stands, and the potential for plants heaving out of the ground.

In general, wheat plants are extremely resilient and can recover from considerable stressors endured during the winter. As such, it is typically not profitable to terminate wheat fields to plant full-season soybean. However, given the extreme conditions this fall and winter, coupled with the fact that many fields planted in late October and even into November have barely emerged from the soil, there may be some wheat fields that may be more profitable in a full-season soybean production system rather than a wheat/double-crop system.

To determine the condition of wheat fields, and ultimately whether to continue with a wheat crop or to change to a full-season soybean crop, tiller counts will be necessary at Green-Up (Feekes 3). In general, the number of tillers for a 3 foot section of row are counted at several representative locations throughout the field. Only count tillers that have at least 3 leaves per plant. To convert tiller counts to tillers per square foot, first multiply your average tiller counts by 4, then divide by the row width in inches.

Example:

Average tiller counts of 200 for a 3 foot length of row with 7.5" row widths

(200 x 4)/7.5" = 107 tillers per square foot

Generalized estimates of the expected yield potential based upon the number of tillers (and plants) per square foot at green-up can be found in Table 1. Additional information on tiller and stand counts can be found in *Section 3: Cultural Practices* in *A Comprehensive Guide to Wheat Management in Kentucky* (http://www2.ca.uky.edu/agcomm/pubs/id/id125/id125.pdf).

Table 1. Wheat yield potential for a range of tillers and plants per square foot. Adapted from a table in *Section 3: Cultural Practices* in *A Comprehensive Guide to Wheat Management in Kentucky* (http://www2.ca.uky.edu/agcomm/pubs/id/id125/id125.pdf).

Plants per square foot	Tillers per square foot	Potential Yield (%)[a]
30-35	90-105	100
24-28	72-84	100
18-21	54-63	90-95
15-18	45-54	75-80
12-14	36-42	60-70
6-7	18-21	40-50

[a]This provides an estimate of the relationship of wheat stand to yield potential and is only a guide. Many factors (plant vigor, weather, disease, fertility management, planting date, and variety) influence how a wheat stand ultimately responds to achieve its final yield potential.

Figure 1. Wheat stands in winter of 2019 that were planted in early October 2018, Princeton, KY.

Figure 2. Wheat stands in winter of 2019 that were planted the third week of October 2018, Princeton, KY

Figure 3. Wheat stands with yellow and drowned areas in the field.

Carrie Knott, Extension Grain Crops Specialist

Hold on to Your Insecticide Sprays to Manage Aphids in Wheat in the Harsh Winter of 2019

Dr. Raul T. Villanueva — Extension Entomologist

Insecticide spray programs for aphid management should follow integrated pest management practices instead of calendar-based programs. In Kentucky, the rest of the USA, and many other parts of the world, calendar-based insecticide programs continue to be used due to ease of implementation, time constraints for scouting, and economic savings achieved by reducing trips across fields.

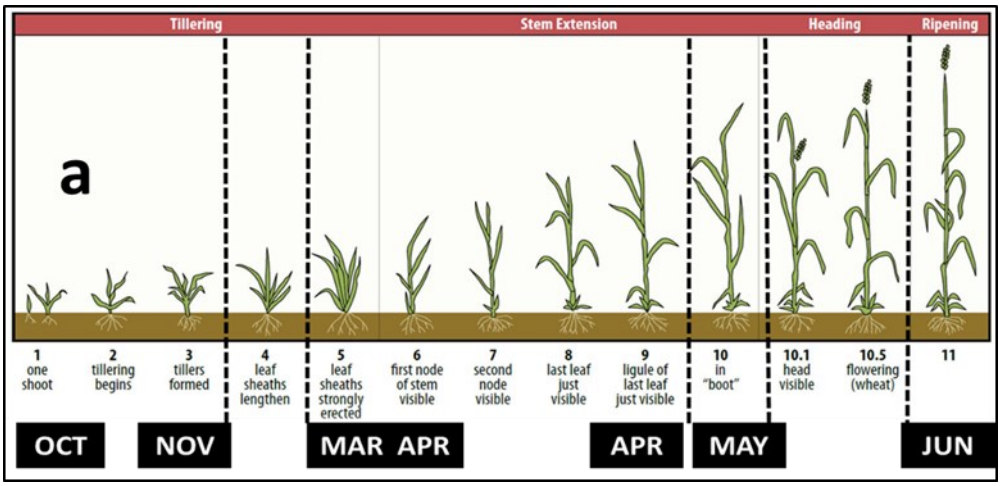
The bird cherry oat, English grain, greenbug, and corn leaf aphids are the most important species in Kentucky wheat fields. They are the key pests on wheat grain production for their role as vectors of Barley Yellow Dwarf Virus (BYDV). Bird cherry oat and English grain aphids overwinter as nymphs or adults, and they can start feeding (and potentially transmit viruses) when temperatures are above 45°F. They start probing plants when temperatures are greater than 45°F. At constant 50°F temperatures, these aphids may complete their life cycle in 28 to 30 days, whereas at 77°F, the life cycle can be shortened to approximately 8 days. Below 45°F, aphids are inactive, lethargic, and sheltered in soil crevices near the bases of wheat stems.

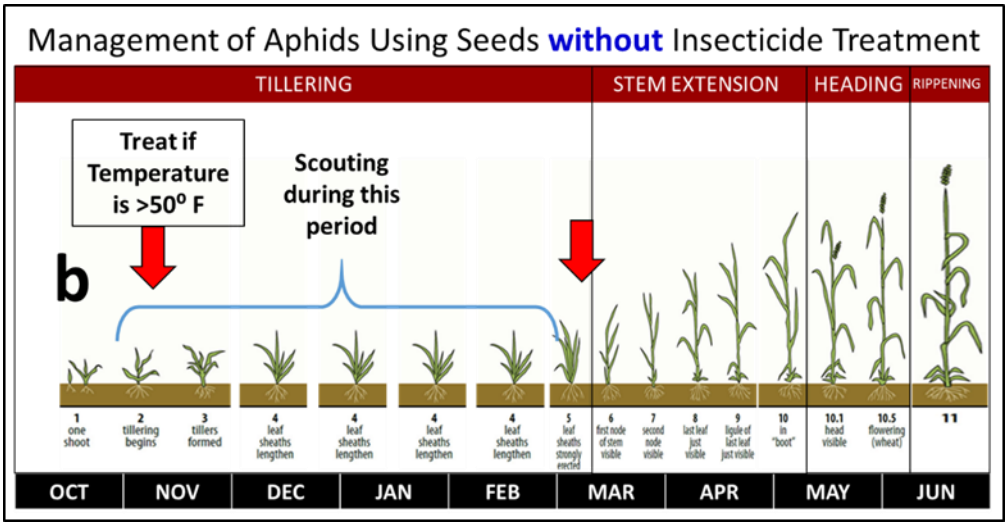
Given the circumstances mentioned above, and considering the harsh temperatures during this winter, farmers in Kentucky should restrict the use of insecticide applications to manage aphids on small cereals. Figure 1a shows the "classical" view of the Feekes scale of wheat development; while figures 1b and 1c show wheat development adjusted to time in months for spraying wheat planted using seeds without (1b) and with (1c) insecticide-treated seeds.

In 2018, plants grown without insecticide seed treatment (Figure 1b) should not have been sprayed. However, if temperatures were greater than 50°F and the average numbers of aphids were greater than or equal to 3 per foot row, one insecticide spray might be needed by mid-November to early December. Also, an additional spray might be applied in early or mid-March only if aphid tallies show that the mean numbers of aphid are greater than or equal to 10 per foot row. These potential sprays are represented by the arrows in Figure 1b.

On wheat plants grown with insecticide-treated seeds (Figure 1c), insecticide sprays should not have been applied for at least 30 to 35 days after plants emerged (DAE). Insecticides on seeds should keep aphids at low numbers even if temperatures were greater than 50°F by mid-November or December. In these plants, a spray might be applied in early or mid-March only after tallies have shown that the mean numbers of aphids are greater than or equal to 10. These potential sprays are represented by the arrow in Figure 1c. After the period described above, any growers should consider the threshold (greater than or equal to 10 aphids), and scouting should be conducted for plants grown with and without insecticide seed treatment.

To reduce insect pest and manage insecticide resistance, farmers should consider different tools for IPM programs. These include the use of tolerant cultivars, crop rotations, early/late planting to avoid pests, and scouting to monitor pests or the abundance/absence of natural enemies. Insecticides (as seed treatments or foliar applications) should be considered a tool of integrated pest management, rather than the solution to insect pest problems. Finally, when sprays are applied, use the rates established on the insecticide label; lower rates will increase insecticide resistance.





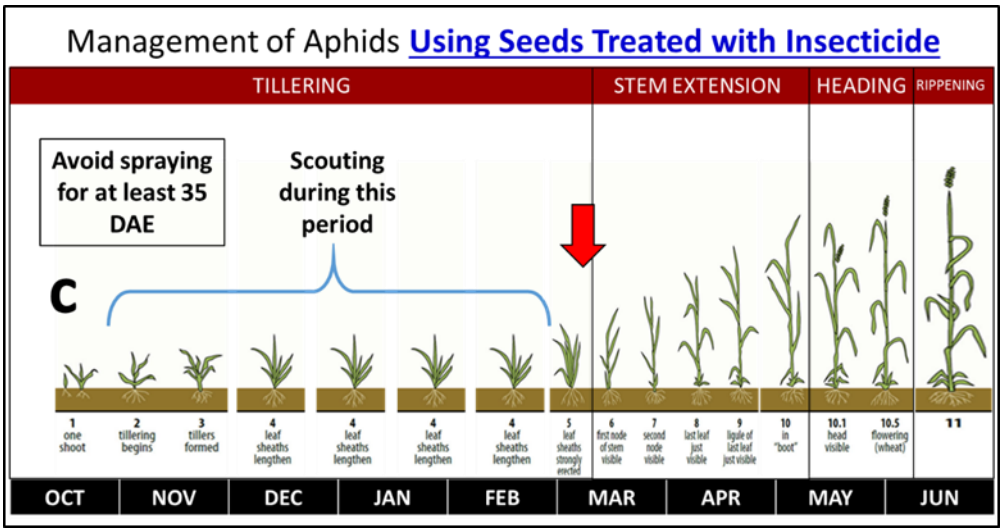


Figure 1. Feekes scale of wheat development (a) "classical" display, and modified display adjusted to time in months to spray against aphids in wheat planted using seeds (b) without and (c) with insecticide seed treatment. Red arrows indicate the "potential necessary" insecticide spray periods for controlling aphids.

Combining Crop Insurance and Forward Contracts to Reduce Revenue Risk for Wheat and Double-Crop Soybeans

Dr. Todd D. Davis— Extension Grain Marketing Specialist

Managers should consider the potential risk protection provided by combining crop insurance with forward contracts to manage revenue risk for wheat and double-crop soybeans. The crop insurance decision was made last September for wheat. However, the insurance deadline for soybeans is March 15, 2019, and farmers will have time to create enterprise budgets, evaluate the farm's financial position to absorb a loss and to assess how crop insurance can fit into their risk management plans.

The analysis uses the budget information from Table 1. The yields are from the Kentucky Farm Business Management (KFBM) program's annual summary for the Pennyroyal area and are the Olympic-Average yield for the last five years. The KFBM data combines yields from different farms over a multi-county area and may understate the yield potential for wheat or double-crop soybeans for a particular farm. The cash price is the cash forward contract (CFC) bids for western Kentucky elevators for June delivery for wheat and November delivery for double-crop soybeans. The cash rent is assumed to be $185/acre; however, this cost varies significantly across the state. The cash rent expense is shared equally by both crops.

The budgeted return over total costs for wheat is -$15/acre while double-crop soybeans have a budgeted return of $93/acre (Table 1). The break-even prices needed to cover total variable costs, variable costs plus rent, and total budgeted expenses are included in Table 1 to help guide pricing decisions. At a yield of 85 bushels/acre, a wheat price of $4.70/bushel is needed to cover total variable costs plus rent, and a price of $5.44/bushel is necessary to cover total costs. Double-crop soybeans need a price of $6.62/bushel and $7.35/bushel to cover total variable costs and total costs, respectively, for a 50-bushel double-crop soybean yield (Table 1).

Table 1. 2019 Projected Returns over Total Variable Costs, Cash Rent and Overhead Costs.

	Wheat	DC Soybeans	Wheat+ DC Soybeans
Cash Price	$5.27	$9.21	
Yield	85	50	
Revenue	$448	$460	$908
Total Variable Costs	$307	$238	$545
Overhead	$63	$37	$100
Return over TVC + OH	$78	$185	$263
Rent	$93	$93	$185
Return over Total Costs	-$15	$93	$78
Break-Even Price for Various Cost Objectives ($/bushel)			
Total Variable Costs	$3.61	$4.77	
TVC + Cash Rent	$4.70	$6.62	
TVC + Cash Rent + Overhead Costs	$5.44	$7.35	

The July 2019 wheat futures contract closed at $5.27 per bushel on January 31, 2019, with harvest forward contract bid average $5.27 per bushel. Assuming budgeted yields, the market is $0.17/bushel short of covering estimated costs. The January 2020 soybean contract closed at $9.65/bushel on January 31, 2019, with the November 2019 cash forward contract bid average $9.05/bushel. As shown by the break-even prices in Table 1, managers can remove some revenue risk for double-crop soybeans using commodity futures or forward contracts.

Some managers may hesitate in pricing wheat or soybeans before yields are known because of yield risk and the inability to fulfill a contract. Revenue protection (RP) crop insurance exists to provide confidence to managers forward contract or hedging the crop before the crop reaches maturity or is even planted. Figure 1 demonstrates how RP insurance and forward contracting a conservative percentage of average production can be used to mitigate revenue risk.

The projected price for 2019 RP insurance for soybeans will be determined in February; however, the November 2019 soybean futures contract has been trading around the $9.55/bushel level for several weeks. The risk management example assumes the RP price of $9.55/bushel, a crop insurance APH yield of 50 bushels/acre, and insurance coverage at the 75% level. The marketing plan is to forward contract 40% of expected production (20 bushels) at the forward contract price of $9.35/bushel, which requires the bids to increase by $0.30/bushel between now and harvest.

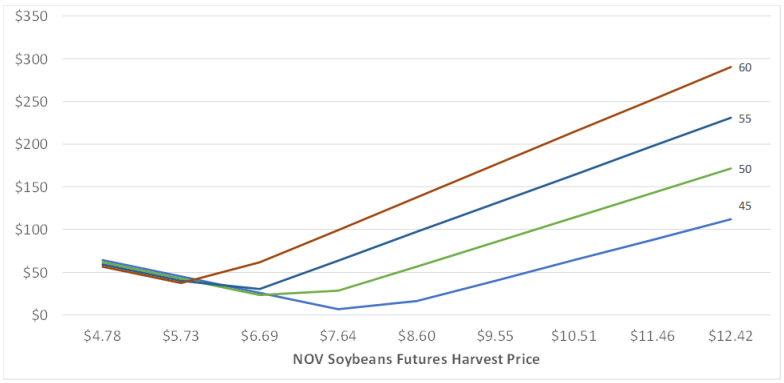


Figure 1. Return over Total Inputs, Land, and Overhead Costs for 2019 Western Kentucky Double-Crop Soybeans.

The lines in Figure 1 represent the return over budgeted costs for varying yields for double-crop soybeans. The minimum return for 50-bushel soybeans is $23/acre at the futures price of $6.69. If prices decline further, crop insurance indemnities provide a larger profit. Similarly, more substantial than expected yields improve profitability. If the double-crop soybeans yield 45 bushels/acre, then the minimum return is $7/acre at the futures price of $7.64/bushel.

The risk management plan for wheat presented in Figure 2 assumes RP crop insurance was purchased at the 75% coverage level at the projected price of $5.63/bushel. The marketing plan is to forward contract 40% of planned production (85-bushel planned yield) at the contract price of $5.40/bushel, which will require cash bids to increase by $0.18/bushel between now and harvest.

The graph of the wheat enterprise returns over budgeted costs also includes the revenue from the double-crop soybeans at a yield of 50 bushels/acre. Double-crop soybean revenues are included in the graph to demonstrate how soy contributes to enterprise profitability.

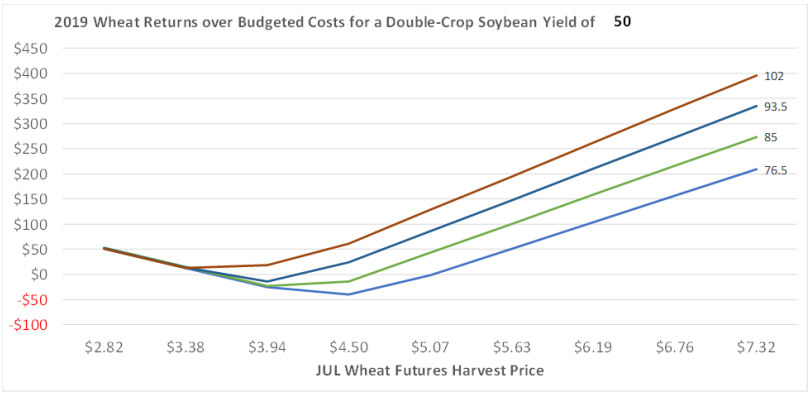
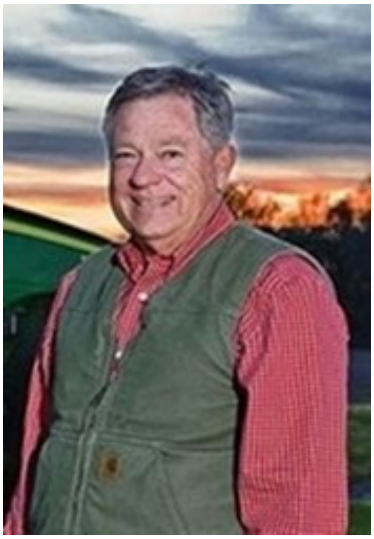


Figure 2. Return over Total Inputs, Land, and Overhead Costs for 2019 Western Kentucky Wheat for a Double-Crop Soybean Yield of 50 bushels/acre.

If wheat yields are average (85-bushels), then the wheat/double-crop soybean enterprise has a return of -$14/acre when July 2019 wheat is at $4.50/bushel. A 10% larger yield (93.5-bushels) is profitable until the July 2019 wheat future price is $3.94/acre.

Because of the lower cost structure, locking in a large percentage of expected double-crop soybean production at $9.35/bushel in the spot market buoys the wheat enterprise. Managers should monitor both the wheat and soybean market for opportunities to remove price risk in both markets.

The purpose of this article is to demonstrate how risk management tools can be combined to protect revenue. Unfortunately, there is not a silver bullet cure to provide 100 percent risk protection. Managers should calculate how much working capital is available and gauge how much risk can be absorbed by the farm business. The risk that cannot be absorbed by the farm business should be passed to the insurance market and price risk tools.



Remembering Don Halcomb

Don Halcomb, visionary grain farmer from Schochoh, Kentucky, was laid to rest on January 21, 2019. His passing has given the members of our Wheat Science team cause to reflect on the ways in which he influenced our group and the ways in which he impacted wheat production in Kentucky. Don had a unique ability to ask big questions and challenge those around him to think bigger too. He urged us to study no-till wheat, to focus on scab resistant wheat varieties, and to assess the impact of a changing climate on wheat production and profitability. It was Don Halcomb who said that wheat varieties should be released like open source software, giving birth to the Pembroke brand of wheat varieties. And most recently, Don provided the spark that led to the Wheat Field Schools. The core of the Wheat Science group has existed under various names for close to 40 years, but it was guidance from Don that nudged us in the direction of more cohesive teamwork. We had worked as individual scientists, we shared the outcomes of our experiments with the group, but out of respect for one another, we were reluctant to step too far out of our disciplinary boundaries in asking hard questions. Don Halcomb helped us understand that by asking those tough questions, and working to understand each other's research, we could only make our group better – and that would ultimately be better for the wheat industry we serve. He set a good example, by challenging every one of us with tough questions whenever we talked! Along with his spirited challenges came unending support and friendship to all of us in the group. Like many in Kentucky's agricultural community, we will miss him. Dave Van Sanford

As a Cover Crop, How Does Wheat Compare to Cereal Rye?

Dr. Erin Haramoto — UK Weed Science Assistant Professor

We've conducted an experiment over the last two years to compare how wheat and cereal rye perform as cover crops—research funded by the Kentucky Soybean Promotion Board. We drilled and broadcast two different seeding rates (30 and 100 lbs seed/acre) of each species and measured establishment, ground cover, and biomass of both the cover crop and winter weeds. All cover crops were planted in mid-October after corn harvest in Lexington; we drilled using a commercial-scale John Deere no-till drill and mimicked broadcasting the seed prior to harvest (so seed was on the soil surface rather than on the corn stover).

The species, planting method, and seeding rate can all influence the amount of cover crop biomass produced. Cereal rye produced more biomass than wheat in almost all conditions, but particularly over the winter of 2016-17. Other researchers across the Midwest, the Midsouth, and South have noted this too—cereal rye suffers less mortality from cold temperatures than wheat and also has a lower base growing temperatures so can put on more biomass during our mild winters when temperatures are marginal for wheat growth. Drilling seed was essential in the Fall of 2016 when it was very dry—the North Farm received only 2" of rain in October and November and broadcast seed did not establish well at all this fall! This poor establishment led to low biomass production the following spring—plots with broadcast seed produced only about 25% of the biomass compared to those with drilled seed. Interestingly, reducing the cereal rye seeding rate actually increased biomass production in one year! It had the opposite effect for wheat. Where we had more cover crop biomass, we generally had less winter weed biomass (weeds like common chickweed, purple deadnettle, henbit, etc.).

What about ground cover over the fall, winter, and early spring? We measured this by taking digital photos and analyzing the amount of green (plants) as opposed to brown (soil). Usually, cover crops that produced more biomass also produced more ground cover. So, drilling seed in that dry fall resulted in better ground cover, and planting cereal rye instead of wheat resulted in more ground cover. When we had a cold snap in early 2018, cereal rye lost less ground cover than wheat and rebounded quicker (again, since it is more tolerant of these cold temperatures). But, increasing the seeding rate also increased the ground cover produced, though it didn't affect biomass production in the way we expected.

So… is cereal rye a better cover crop than wheat? It depends what you want to get out of the cover crop. If you're concerned with having too much biomass in the spring, then wheat may be a good option. You can't just decrease the cereal rye seeding rate and expect to get less biomass! However, be aware that you will likely get less ground cover and more winter weeds with the wheat than if you used cereal rye. We did this trial with 'Aroostook' cereal rye and 'Pembroke 2014' wheat—and the results may vary with different varieties!

Our research into cover crops continues—we currently have projects in both corn and soybean looking at different cover crop planting dates, cereal rye varieties, combining cover crops and herbicides for best weed control, and many others. We've also just wrapped up a large project on mixtures of crimson clover with both cereal rye and wheat and are analyzing data on how planting date and termination date affect nitrogen contribution, forage quality, and also weed control. Stay tuned for these results!

Figure 1. Ground cover produced from 100 lbs of drilled cereal rye (left) and 100 lbs of drilled wheat (right). Cereal rye produced more ground cover than wheat in this year, and more than wheat after the cold snap in early 2018 as well. Photos from 2/13/17.

Figure 2. Ground cover produced from 100 lbs of drilled cereal rye (left) and 100 lbs of broadcast cereal rye (right). Photos from 11/17/16. Note differences in establishment due to extremely dry conditions in the fall of 2017.

Webinar to Help Wheat Producers Better Manage Fusarium Head Blight

Dr. Carl Bradley — Extension Plant Pathologist

Fusarium head blight can be a devastating wheat disease.

February 4, 2019 | By: Katie Pratt

Princeton, Ky.,- A national group of plant pathologists, including Carl Bradley from the University of Kentucky, is presenting a webinar to help U.S. wheat producers get a jumpstart on their management strategies for controlling Fusarium head blight.

Fusarium head blight, also known as "head scab," is one of the most destructive diseases of wheat and an annual concern for growers. The disease can lower yields and tests weights, but the larger, system-wide concern is that the fungus that causes head scab also produces a mycotoxin, deoxynivalenol, known as DON, that can contaminate grain. Because DON is harmful to humans and animals, grain elevators regularly test for it. Grain containing high levels of DON may be highly discounted or outright rejected, which causes a major economic strain to farmers with affected fields.

"These webinars will provide the most up-to-date research findings about management of Fusarium head blight," said Bradley, a faculty member in the UK College of Agriculture, Food and Environment. "Anyone that has an interest in learning about managing this important disease, including farmers, crop consultants and industry representatives, should sign up for these free webinars."

During the two-part American Society of Agronomy webinar series, Bradley, Pierce Paul, plant pathologist at The Ohio State University, and Christina Cowger, plant pathologist with the U.S. Department of Agriculture's Agriculture Research Service, will discuss cultural practices, resistant varieties and fungicides that play a part in effective Fusarium head blight management. The USDA-ARS U.S. Wheat and Barley Scab Initiative, which is sponsoring these webinars, funded much of the research that the scientists will present.

The webinars are at 11 a.m. CST on Monday Feb. 11 and Monday Feb. 18. Anyone can register for the free webinars at https://tinyurl.com/ycmvel4p. Contact: Carl Bradley, 859-562-1306, carl.bradley@uky.edu Writer: Katie Pratt, 859-257-8774

USEFUL RESOURCES

KyGRAINS.info

College of Agriculture, Food and Environment

WHEAT SCIENCE GROUP

http://wheatscience.ca.uky.edu/

Kentucky Pest News

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http://kentuckypestnews.wordpress.com/

KATS

Kentucky Agriculture Training School

Crops Marketing and Management Update

http://www.uky.edu/Ag/AgEcon/extcmmu.php

Kentucky Agriculture Training School (KATS)

KATS
Kentucky Agriculture Training School

This is a hands-on workshop, presented by UK specialists and industry experts, pertaining to early season management issues and considerations.

A majority of this training will be outside, dress appropriately for the field and weather.

March 7, 2019
9:00 am to 4:00 pm

Topics:

- Early Spring Assessment of Wheat Conditions
- Winter Annual Weed Management in Wheat
- Pre-Plant Weed Management in Corn and Soybeans
- How Soil Management Decisions Influence Planter Performance
- Improving Profitability Through Machine Management

Pre-registration is required at: *https://ukkats372019.eventbrite.com*

Registration cost: $105 Lunch will be provided

2019	***EVENT***	***LOCATION***
FEBRUARY 11 & 18	Management of Fusarium Head Blight (Scab) of Wheat Webinar Series	(See Page 10)
MARCH 6	2019 IPM TRAINING	HOPKINSVILLE KY
MARCH 7	KATS (KY Agriculture Training School) Wheat Management at Green-UP/Pre-plant Decisions for Corn & Soybean	PRINCETON KY
MAY 14	**UK WHEAT FIELD DAY**	**PRINCETON KY**
MAY 21	KATS—Field Crop Scouting Clinic	PRINCETON KY
JUNE 13	KATS— Mid-Season Corn & Soybean Considerations/Preparing for Wheat Harvest & Storage	PRINCETON KY
JULY 18	KATS—Spray Clinic	PRINCETON KY
JULY 23	**UK CORN, SOYBEAN & TOBACCO FIELD DAY**	**PRINCETON KY**
AUG 22	KATS—Disease ID & Management/Harvest & Storage/Cover Crops	PRINCETON KY
SEPT 19	KATS—Late-Season Management of Corn & Soybeans/Successful Wheat Establishment	PRINCETON KY

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Research and Education Center
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