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COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT
Grain and Forage Center of Excellence
University of Kentucky

Corn & Soybean News

Corn Ear Rots Observed in Kentucky

Kiersten Wise—Extension Plant Pathologist

Scouting reports have indicated that two important ear rots have been observed in Kentucky corn as harvest begins: Diplodia ear rot and Fusarium ear rot. A different fungus causes each of these rots, and the environmental conditions at and just after silking influence which ear rot may be problematic in a given year. Additionally, the fungus that causes Fusarium ear rot produces mycotoxins as a byproduct of the infection process. It is important to identify fields that may have ear rots to ensure timely harvest, proper storage of moldy grain, and determine the potential for mycotoxin issues.

Figure 1. Diplodia ear rot

(photo provided by Kiersten Wise)

<u>Diplodia ear rot</u>

Diplodia ear rot is caused by the fungi *Stenocarpella maydis* and *S. macrospora*, and is very common in cornfields across the Corn Belt. This fungus survives in residue and infects plants shortly after pollination. Humid weather and rains prior to and after pollination will favor disease development. Diplodia ear rot is identified by white fungal growth on the cob, often forming a mat of fungus across the ear (Fig. 1).

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Infected kernels may also be brown-gray in appearance. Small, black fungal structures called pycnidia may form on the kernels or the cob. The fungus is reported to produce a mycotoxin called diplodiatoxin in South America and South Africa, however, no reports of toxic effects of grain on livestock or humans due to Diplodia ear rot have been reported in the United States.

Grain dockage may still occur, however, due to moldy grain. More information on Diplodia ear rot can be found in University of Kentucky publication:

http://plantpathology.ca.uky.edu/files/ppfs-ag-c-05.pdf

Fusarium ear rot

Fusarium ear rot is primarily caused by the fungus

Figure 2. Fusarium ear rot (photo provided by Kiersten Wise)

Fusarium verticilliodes. This fungus infects corn after pollination, and infection is favored by warmer temperatures. Fusarium-infected ears may have white to purple fungal growth on the cob, or symptoms may appear as discolored kernels scattered throughout a cob or associated with insect feeding (Fig. 2). Visible fungal growth may not be obvious on the cob, but a white "starburst" pattern in kernels can sometimes be observed on ears infected by this fungus. The mycotoxin fumonisin is associated with Fusarium ear rot.

Ear rot management

Regardless of which ear rot is present in a field, farmers should scout fields prior to harvest and determine the level of incidence of any ear rot in the field. If ear rots are observed in a field, affected areas should be harvested early and grain segregated to avoid contamination of non-infected grain. Grain harvested with suspected ear rots should be dried to below 15% moisture. If grain is stored above this moisture content, mold can continue to grow, and any mycotoxins present can continue to accumulate in grain. All grain contaminated by any ear rot fungus should be stored separately from good grain, and if stored long term, it should be stored below 13% moisture to prevent further growth of fungi.

Several publications on ear rots and mycotoxin management are available through the Crop Protection Network:

https://cropprotectionnetwork.org/resources/publications

These publications provide information on ear rot identification and management, as well as answers to frequently asked questions about mycotoxins, and storing moldy grain.

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Dry Corn Quickly to Avoid Problems During Storage

Sam McNeill—Extension Agricultural Engineer

As grain farmers farmers shift gears from production to the post-harvest phase, it's worth taking another look at the information that helps guide good management decisions. Specifically, it's important to recall that corn has a limited shelf life that depends largely on the moisture content and temperature of the grain. The allowable storage period is the length of time good quality, aerated shelled corn can be stored before losing ½% of dry matter. Even so, with this amount of dry matter decomposition, it is assumed that corn loses some quality but maintains its market grade.

The table below can be used to estimate the shelf life of aerated, undamaged corn based on the moisture content and temperature of the grain. These values can be used to estimate the allowable storage times for other grains based on corresponding equilibrium moisture content but are not valid for corn held without aeration. In fact, unaerated, damaged corn may deteriorate 2 to 3 times faster than indicated by the values shown in the table. It is often common to see mold develop on fines and broken kernels several weeks before it becomes apparent on undamaged corn kernels.

An area of possible confusion is that the shelf life data were determined for aerated corn maintained at a constant temperature over the entire storage period. In practice, corn is not aerated while held in a truck, and temperatures change from harvest to storage.

Corn deterioration is a cumulative process and remaining shelf life progressively decreases during each step in the harvest-holding-drying-storage process. The amount of time lost depends on the corn moisture and temperature at each step and the initial grain condition. Values in the table can be used as a guide to accumulate the percentages and determine the safe storage period.

For example, assume corn was harvested at 24 percent moisture content and allowed to remain in a truck overnight (0.5 days) before unloading. The average temperature in the truck was 70°F and the corn was then placed in a holding bin with a cooling fan where it was maintained at 70°F for another ½ day (12 hours) before it was dried to 15% and cooled to 60°F. How long can the corn be held at 60°F without exceeding the shelf life?

From the table, the shelf life after 12 hours in the (unaerated) truck is 3.5 days (7/2), so 14% of the storage life is lost (0.5/3.5). After 12 hours in the aerated holding bin another 7% is lost (0.5/7), so the remaining storage life after drying to 15% moisture and cooling to 60°F is reduced by 21% (58 days) leaving 219 days or 7 months. Of course, cooling the corn further to 35-40°F during the Fall will add more days of safe storage, but should help to explain why corn that will be stored into the summer should be dried to 13% moisture.

The allowable storage times shown in the table assume typical harvest damage levels (1.5 - 2 percent), and may be conservative for corn that is screened before being put into storage. On the other hand, the storage times may be optimistic if excessive damage exists. While allowable shelf life data provides valuable information for holding corn, the values should be viewed as guidelines and should not be considered absolute.

Uniform aeration and safe, vigilant monitoring of stored grain will help to maintain quality and minimize elevator discounts when sold. More details on preserving farm stored grain is available from the Midwest Plan Service Handbook on Grain Handling, Drying and Storage (MWPS-13, 2017 ed.).

Equilibrium moisture content values for corn, grain sorghum, soybean and wheat are posted on the UK-BAE web page for grain storage

https://www.uky.edu/bae/bae-extension-newsletter

Grain Temp.	Corn Moisture, %wb							
	14%	15%	16%	18%	20%	22%	24%	26%
40	>365	>365	>365	288	142	84	57	42
50	>365	>365	336	128	63	38	25	19
60	>365	277	149	57	28	17	11	8
70	322	154	83	32	16	10	7	5
80	180	86	47	18	9	6	4	3
90	101	48	26	10	6	4	3	3

Soil Sampling—Why, When, How and What to Expect

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Soil sampling is one of the most important operations a producer can perform in support of their production system. A properly collected soil sample will indicate the current nutrient status of the area sampled and the results will provide nutrient recommendations for the specific crop(s) to be grown next. There are two primary ways to lose money in a soil fertility program: fertilizing fields that have adequate present fertility, "wasting money" on unnecessary inputs, and not applying needed fertilizer which can result in yield and income losses. Soil samples submitted to your local County Extension office can range from free (no charge) to about $8 per sample, depending upon the county. This investment will provide information that can reduce management costs and increase profits. The purpose of this article is to discuss best times to collect samples, how to collect samples, and what to do with the resulting information.

The University of Kentucky Cooperative Extension Service recommends collecting soil samples every 1 or 2 years, depending on the crop, crop management, and fertility management strategy. Soil samples should be collected more often for higher value crops and crops with high nutrient removal rates. For example, dark-fired tobacco (high value), silage corn (high removal), and alfalfa (high value and high removal) should be sampled every year. A corn-wheat-double crop soybean rotation can be sampled every other year and soil fertility adequately maintained, in most instances. Most of the residue from the corn, wheat, and soybean is returned to the field and only the grain is removed. Years with abnormally high or low yields may result in an out-of-cycle sampling. Annual sampling is always acceptable and allows more precise nutrient management.

Soil samples can be collected at any time during the year. However, fall sampling is usually preferred over other times of the year. In the fall, after harvest, soils tend to be drier than in the spring or winter, soil testing labs tend to be less busy, and there is plenty of time before planting to make fertility decisions. There can be some seasonal variation between fall and spring sample results due to residue breakdown, residual fertilizer salts and rainfall, so it is best to be consistent in the time samples are collected from any one field. Fertility recommendations were made on average based on research done across the entire state and might lack specificity, but they provide the best starting point. In this context, soil test history provides value to improve site specific recommendations. Compare samples over time to see how they vary from year to year, based on fertilizer application and estimated nutrient removal. If soil sample test results trend up or down over a several year period following provided recommendations, adjustments can be made using this historical information.

Soil sampling depth depends on tillage. Fields that are tilled should be sampled to 6 inches or the depth of primary tillage tool operation. No-till and minimum-till fields should be sampled to a 4 inch depth. These depths show the best correlation between crop response and nutrient additions in Kentucky. If sampling shallower or deeper, the results can lead to erroneous fertilizer rate recommendations. For example, if a 2 inch sample is collected in a NT field the results will be higher than a sample collected at 4 inches due to the stratification of nutrients at the soil surface. This higher nutrient status will result in a lower fertilizer rate recommendation for that field. Collecting soil samples to the correct depth is a critical component to getting reliable nutrient recommendations.

Use a clean plastic bucket to collect soil cores. Galvanized buckets release zinc to the soil sample, causing erroneously high zinc soil test results. It is best to sample similar areas within a field while avoiding anomalies such as old fence rows, feeding areas, low areas, or any place that would result in a considerably different soil test result. Soil samples should represent areas no larger than 20 acres in size if relatively uniform or no more than 10 acres with less uniform fields. Remember, the results of the soil sample are only as good as the sample submitted to the lab. Take 10 – 20 cores per sample, mix well in the bucket, and place enough soil in the sample bag or box to meet the requirements of the lab. Record all the requested information on the sample submission form and submit the sample to your local County Extension Office.

What you receive as soil test results depends on the analyses requested, but not the lab the sample is submitted to, as long as the lab methods are the same. Soil pH, buffer pH, and plant available phosphorus, potassium, and zinc should all be evaluated, regardless of the lab. Most labs will also report plant available calcium and magnesium, but these nutrients are seldom low enough to limit crop yield in Kentucky as long as an adequate pH is maintained. Some labs will also report plant available sulfur, copper and iron. These values have very little meaning in Kentucky, because they are not supported by crop response correlation and calibration research done on Kentucky soils. A few sulfur deficiencies have been reported in Kentucky, as has one copper deficiency, but there have been no reports of iron deficiency on pasture and row crops. The area of sulfur and copper deficiencies has been too small to permit any crop response research. Field history, long-term soil test records, visual

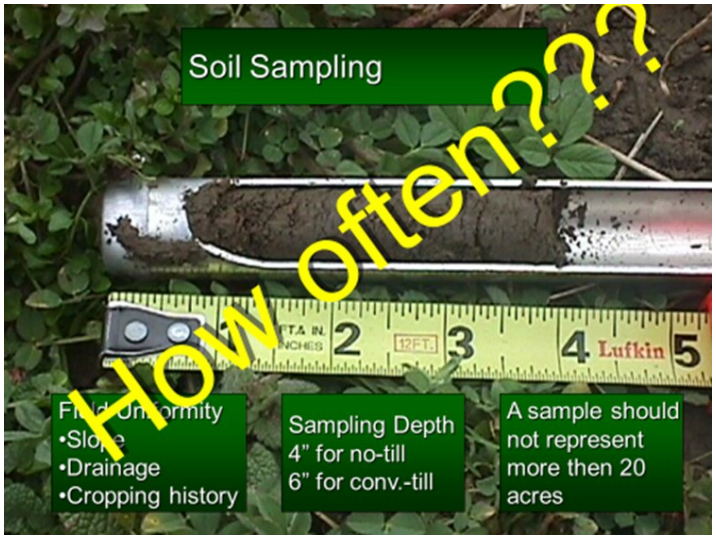
diagnosis, and tissue testing should all be used as part of a strategy to manage sulfur and micronutrients like iron or copper.

The results provided will be for the next specific crop to be grown. When using one soil sample for a multi-year rotation, remember that the recommendations provided will only be for the next crop specified. Go to AGR-1 (link at bottom of page) for the fertilizer rate recommendations for any following crops in the rotation. Recommended rates of phosphorus and potassium can either be applied prior to each crop (preferred) or summed together and all added at the beginning of the rotation (not as efficient). Any lime rate recommendation is designed to cover a period of 3 to 5 years, depending on the amount of acid forming fertilizer being used and should be applied prior to the first crop in the rotation. If the next year of the rotation is small grain followed by double crop soybean, the phosphorus rate recommendation should be based on the need of the small grain and the potassium rate recommendation should be based on the need of soybean.

Other information found in some soil test reports include CEC (cation exchange capacity), % Base Sat (base saturation), and particular nutrient ratios. These values are not the basis of valid fertilizer rate recommendations in Kentucky. The CEC is a measure of the soil's negative charge, which can influence the amount of positively charged nutrient ions a soil can hold. Approximately 85% of the surface soils in Kentucky have a CEC between 11 and 18 meq/100 grams of soil. So the variation is small and wouldn't greatly influence recommendations. The CEC typically reported is a numerical estimate, based on the buffer pH and extractable plant available potassium, calcium and magnesium, and varies +/- 2 to 3 meq/100 grams of soil. At best, this is a rough estimate of the true CEC, which is much more costly and time consuming to determine. The CEC can provide information regarding soil texture and/or organic matter content. But soil texture can be better determined by quick observation during soil sample collection and soil organic matter can be accurately determined in the lab for a nominal fee. Base saturation is the relative concentration of "base cations" in the soil, including potassium, calcium, magnesium and sodium. This is also based off the "estimated CEC" typically found in most soil test reports. It is not the ratio of nutrients that influences plant uptake and growth, but is rather the absolute amount of available nutrients. This is why CEC, base saturation, and nutrient ratios are not as important to good fertilizer rate recommendations as using the available nutrient concentrations as determined in conventional soil test extractions. It is important to note that there are still sources that recommend use of cation/nutrient ratios as a way to manage nutrient applications or use of CEC to manage nitrogen rate applications. However, these philosophies have been repeatedly debunked and are generally regarded as nonsense throughout the scientific community. You'd be wise to steer clear of anyone promoting these approaches.

Remember, when taking soil samples, collect them to the right depth based on tillage, at a similar time of the year, using the appropriate bucket, and to adequately represent the field. The results returned are only as good as the sample submitted. Consult with your local County Extension Agent with any additional questions or concerns regarding soil sampling.

Ritchey, E.L. and J.M. McGrath. 2018. AGR-1. 2018-2019 Lime and Fertilizer Recommendations. University of Kentucky Cooperative Extension Publication. http://www2.ca.uky.edu/agcomm/pubs/agr/agr1/agr1.pdf



Don't Let Cover Crops Become A Pest

Travis Legleiter—Extension Weed Scientist

The use of cover crops in Kentucky is on the rise with more farmers looking to gain an edge wherever they can. Cover crops have many benefits including keeping soils in place over winter, improving soil quality, and in some cases suppression of winter annual weeds. Although, like all agricultural practices there can be drawbacks if a cover crop is not managed properly. As we quickly approach the time to plant cover crops let's look at how to gain the benefits of cover crops and avoiding the situation of a cover crop becoming a pest or introducing a pest.

Usually one of the first considerations when purchasing seed or planning a cover crop is the selection of species. The use of annual ryegrass as a cover crop is highly touted for its underground biomass system, ability to grow in a multitude of growing conditions, and rapid establishment and growth. Farmers should be aware though, that annual ryegrass can also become a weed and the attributes that make it a good cover crop also make it an excellent weed. Annual ryegrass can be very difficult to terminate in the spring and a farmer must be knowledgeable of how to properly terminate annual ryegrass. Annual ryegrass should only be grown by experienced cover crop growers and should be avoided by wheat producers as ryegrass is a major pest in wheat.

A second consideration when choosing a cover crop is understanding the differences in species, and more specifically two species with very similar names. Annual **ryegrass** and cereal **rye** are two different species and care should be used to make sure the two are differentiated. As mentioned above annual **ryegrass** should only be grown by experienced growers, whereas cereal **rye** is a much more forgiving cover crop and is an excellent choice for those growers new to cover crops. If you decide to use cereal **rye** as your cover crop, make sure you are clear when you go to the seed counter that you want cereal **rye** and not **ryegrass** as a mix up at this stage can have lasting effects down the road.

A final consideration when planning your cover crop is whether you are going to plant a single species, multiple species, and where you are going to buy the seed. Unlike our major commodity crops that are supplied by a handful of companies with stringent regulation on seed quality, you can buy cover crops from a variety of sources. Cover crop seed can be purchased from a cover crop dealer, your local feed and seed store, or even the internet if you so choose. With so many choices of cover crop species, seed mixes, and vendors the assurance of quality of that seed is not guaranteed. The one seed quality that is of particular concern is contamination of weed seed. Purchasing seed that has not been screened or tested for the presence of weed seed can lead to a situation of introducing a new pest to your field and/or neighborhood. For example, the state of Iowa encountered an invasions of Palmer amaranth due to conservation reserve program seed mixtures that were contaminated with Palmer amaranth seed. The good intentions of cover crops will be quickly nullified if a new major pest is introduced. To assure that you are not introducing a new weed, buy seed that has been tested for the presence of weed seed and has the documentation to prove it. When purchases a premix of species make sure that it is known that all species in the mix have been screened for weed seed. A little bit of homework by the farmer now to assure he is purchasing clean seed will help avoid future pest problems, while capturing the benefits of cover crops.

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Potential 2019-20 Corn and Soybean Stocks-to-Use and Price Potential

Todd Davis—Extension Grain Marketing Specialist

In atypical year, the August *Crop Production* report provides insight into the size of the corn and soybean crops. The historically late-planted corn and soybean crops have created uncertainty about the planted area and yield potential. Analysts surveyed before USDA released the August reports expected the 2019 corn crop to be 13.16 billion bushels. USDA surprised the corn market by estimating the 2019 corn crop at 13.9 billion bushels, which is 736 million bushels above the average analyst expectation. If realized, the 2019 corn crop would be 520 million bushels smaller than last year's crop.

Future USDA reports will adjust the estimated harvested area and yield for the corn and soybean crops. Table 1 and Table 2 provide a matrix of potential U.S. ending stocks-to-use ratios for varying harvested acres and yields for both crops. The objective of Tables 1 and 2 is to identify what harvested area and yield might support a higher U.S. marketing year average (MYA) farm price for both corn and soybeans.

Let us start this discussion with the corn market. Table 1 assumes a harvested area of 82 million acres from the August report with a reduction of 2 million and 3 million harvested acres from the August estimate. The reduction in the harvested area could be due to an increased amount of drowned out spots in fields this year. The matrix also assumes the August projected yield of 169.5-bushels with lower yields of 165-bushels and 162-bushels.

Table 1 is a matrix of potential ending stocks-to-use ratios for the 2019-20 corn market, assuming carry-in plus imports of 2.41 billion bushels from the August *WASDE*. Total use is held constant at 14.130 billion bushels, which is the total use from the August *WASDE*. The 2019-20 stocks-to-use ratio could be 10.5% if the harvested area is 80 million acres, and the yield is 165 bushels/acre. A 10.5% stocks-to-use ratio suggests the U.S. MYA farm price would be $4.10/bushel, or $0.50/bushel higher than the August 2019 estimate. A yield of 162 bushels/acre and harvested area of 79 million acres suggests a stocks-to-use ratio of 7.6% and a U.S. MYA farm price of $4.75/bushel. A stocks-to-use ratio near 5% would increase the corn price to a level where demand would decline and market dynamics would adjust towards a final stock-to-use ratio closer to 7%.

The story from Table 1 is that the futures price could adjust higher if there is some concern of stocks declining steadily. If a price bump occurs, it could be fleeting, and managers should be prepared to take advantage of pricing opportunities. The yield and acreage uncertainty will likely be debated all fall and into the final report in January. Therefore, a pricing opportunity may not materialize for the December 2019 futures contract, but instead for a deferred futures contract. Vigilance is necessary to monitor pricing opportunities for the 2019 crops as well as opportunities for the December 2020 corn futures contract.

USDA also surprised the soybean market by estimating 2019 soybean planted area at 76.7 million acres, which is 12.5 million acres less than the 2018 crop. Analysts surveyed before the report release expected the 2019 soybean crop at 3.78 billion bushels, which would be 771 million bushels smaller than the 2018 crop. USDA currently pegs the 2019 soybean crop at 3.68 billion bushels, which would be 874 million bushels less than the 2018 crop if realized.

Table 2 provides a similar analysis for the 2019-20 soybean ending stocks-to-use ratio and potential U.S. MYA farm price. The 75.9 million harvested acres from the August report is adopted along with a harvested area that is 600 thousand acres higher or lower. The matrix uses the projected yield of 48.5 bushels/acre along with yields for 44 and 46 bushels/acre.

Table 2 assumes a carry-in plus imports of 1.09 billion bushels and total soybean use of 4.016 billion bushels. These estimates are from the August *WASDE*. If the harvested area is 75.9 million acres and the yield is 46 bushels/acre, the stocks-to-use ratio could decrease to 14.1%, which would correspond to a $9.20/bushel U.S. MYA farm price. For comparison, a farm price of $9.20 per bushel is $0.80/bushel higher than the projections from the August report. Any combination of harvested area and yield that reduces the stocks-to-use ratio below 10% will provide the opportunity for $10/bushel soybeans. However, current fundamentals suggest it is unlikely to reach 10% this year.

The takeaway message from Table 2 is that there could be a slightly more bullish story to tell for soybeans. However, the production loss is not likely to be significant enough to mitigate the impact of a 1.07 billion bushel carry-in. The bearish risk for the soybean market is that production might not decline significantly or even increase slightly from the August estimate.

The soybean market needs a production loss to whittle away at the mountain of stocks. Otherwise, the market will muddle through with lower prices to stimulate use and discourage production. The price dynamics needed to reduce soybean stocks to levels achieved before the trade dispute would require multiple crop years and

planted area to decline further from that planted in 2019. Mother Nature might be providing a quicker route to lower stocks and higher soybean prices. However, any solution provided by Mother Nature will only last one year as a trend or above trend crop will increase stocks. The solution requires improvement in the demand side of the balance sheet through stronger than projected exports.

Table 1. Projected 2019-20 U.S. Corn Stocks-to-Use Ratios for Varying Harvested Areas and Yields Assumptions.

Ending Stocks (Million Bushels)			
Harvested	Yield (bu/acre)		
Area (million)	162	165	169.5
82	1,564	1,810	2,179
80	1,240	1,480	1,840
79	1,078	1,315	1,671

Stocks-to-Use Ratio			
Harvested	Yield (bu/acre)		
Area (million)	162	165	169.5
82	11.1%	12.8%	15.4%
80	8.8%	10.5%	13.0%
79	7.6%	9.3%	11.8%

Source: USDA-World Agricultural Outlook Board and Author's Projections.

Table 2. Projected 2019-20 U.S. Soybean Stocks-to-Use Ratios for Varying Harvested Areas and Yields Assumptions.

Ending Stocks (Million Bushels)			
Harvested	Yield (bu/acre)		
Area (million)	44	46	48.5
76.5	440	593	784
75.9	414	565	755
75.3	387	538	726

Stocks-to-Use Ratio			
Harvested	Yield (bu/acre)		
Area (million)	45	46	48.5
76.5	11.0%	14.8%	19.5%
75.9	10.3%	14.1%	18.8%
75.3	9.6%	13.4%	18.1%

Source: USDA-World Agricultural Outlook Board and Author's Projections.

Ribbon Cutting

Grain & Forage Center of Excellence

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2019

SEPT 15-16	SOUTHEASTERN GRAIN GATHERING — At UK Hort Research Farm	LEXINGTON KY
SEPT 19	RIBBON CUTTING CEREMONY— University of Kentucky Grain & Forage Center of Excellence at UKREC	PRINCETON KY
SEPT 26	KATS—Harvest and Storage Decisions/Cover Crops/Successful Wheat Establishment	PRINCETON KY

2020

JAN 7	UK WINTER WHEAT MEETING	PRINCETON KY
JAN 15-16	KY COMMODITY CONFERENCE	BOWLING GREEN KY
JAN 17	SOYBEAN INTENSIVE MANAGEMENT SERIES	BOWLING GREEN KY
FEB 4	SOYBEAN INTENSIVE MANAGEMENT SERIES	PRINCETON, KY
FEB 5	SOYBEAN INTENSIVE MANAGEMENT SERIES	CLARK CO, KY
MARCH 11	IPM MEETING	PRINCETON KY
MAY 12	UK WHEAT FIELD DAY—UK Research Farm	PRINCETON KY
JULY 28	UK CORN, SOYBEAN & TOBACCO FIELD DAY	PRINCETON KY

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