Corn & Soybean News

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COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

Grain and Forage Center of Excellence

University of Kentucky

Start the Growing Season on a Positive with a Successful Burndown

Herbicide burndown applications have begun in Kentucky and are likely to continue in earnest over the next two weeks. This spring has been tough so far for herbicide applications with wide temperatures swings every couple of days, but the forecast looks promising for good burndown weather. As the sprayers head to the field, I want to give a few quick reminders and tips to help start the growing season with successful herbicide burndowns.

Pay Attention to the Weather

The temperatures this winter and early spring have been warmer than average allowing for advanced growth of winter annual weeds. The majority of species are one to two weeks in growth ahead of a typical year. Unfortunately, as mentioned previously, the unusually warm weather has been mixed with overnight below freezing temperatures. Additionally, March brought above normal precipitation in Western Kentucky. This all adds up to conditions for advanced weed growth, but poor conditions for burndown spray applications. The short term forecast for April is daytime temperatures in the 60 to 80F range with overnight temperatures staying above freezing. These temperatures, especially the overnight lows are ideal for effective spring herbicide burndowns. Unfortunately, those nice spring temperatures are typically accompanied by wind which is not favorable for spring burndowns. Each year I receive numerous calls from specialty crop growers, homeowners, and fellow grain crop farmers with complaints of drift from spring burndown applications. Typically, we are including either growth regulators (2,4-D or dicamba) and/or contact herbicides such as saflufenacil in our burndowns which can cause significant off-target injury at very low rates. As the warm temperatures and calendar give us all spring fever and the urge “to do something in the field” be aware of wind conditions and avoid the costly mistake of drifting onto a neighboring crop.

Another weather condition we must be aware of is rain and forecasted rainfall. Spring can bring unpredictable rain patterns and a pop-up storm can wreak havoc on field activities, especially herbicide

applications. While you cannot control the rain, be aware of the weather forecast and any potential chances of rainfall. Additionally, and more importantly, be aware of the rain-fastness and any rainfall restrictions of the herbicide products you are applying. Refer to Table 1 for the rain-fastness (amount of time needed between application and rainfall to avoid wash-off of the herbicide product) of some common burndown herbicides. Also, be aware that the labels of many newer formulations, including Xtendimax and the Enlist products have language to prohibit applications if excessive rainfall is forecasted in the next 24 to 48 hours (refer to specific labels for exact language).

Table 1. Rain-fastness and additional rainfall restrictions for some commonly used burndown herbicides.

Product[a]	Rain Fastness[b]	Additional comments and rainfall restrictions
Xtenimax or Engenia	4 hours	Do not apply if rainfall that could exceed soil field capacity and result in soil runoff is expected in the next 48 hours
Clarity, Clarifier, Clash, Detonate, Sterling Blue, & Strut	4 hours	
Enlist One & Enlist Duo	4 hours	Application must take place no less than 48 hours prior to irrigation or predicted rainfall (by NOAA/ National Weather Service, or other similar forecasting service)
Shredder 2,4-D LV4	1 hour	The majority of 2,4-D Ester labels do not list a rain free period.
Elevore	1 hour	Avoid application if heavy rainfall is forecast
Roundup PowerMax 3	4 hours	The majority of glyphosate labels do not list a specific rain-fastness, but rather list the following statement: "Heavy rainfall or irrigation soon after application may wash this product off the foliage".
Liberty	4 hours	
Gramoxone SL	15 to 30 Minutes	
Reviton	1 hour	
Sharpen and Verdict	1 hour	

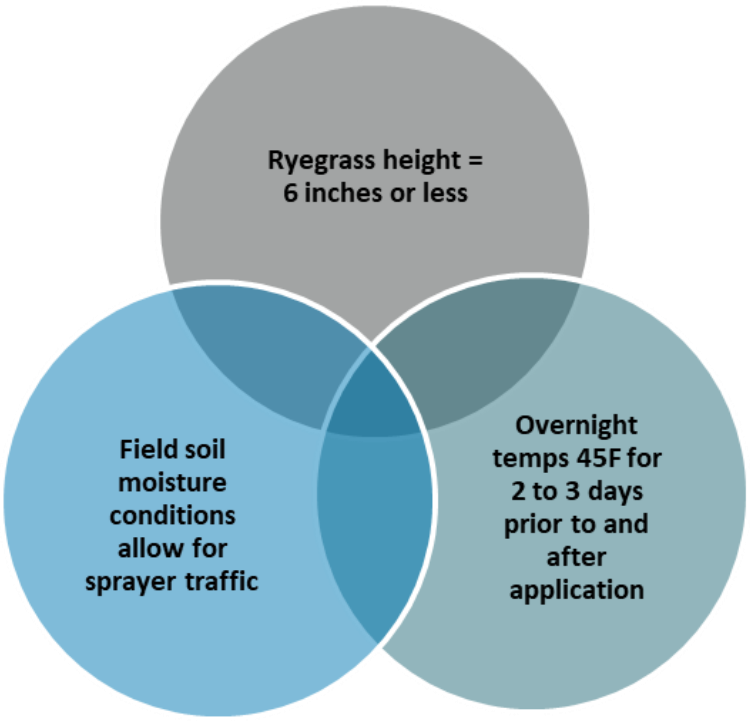
[a] Refer to the label of your specific trade name formulation for the rain free period.
[b] Minimum time span required between herbicide application and first rainfall to avoid significant wash off of herbicide from weed leaf surfaces.

Ryegrass Needs Special Attention

Ryegrass is an ever-increasing issue on Kentucky corn and soybean acres with numerous failed burndowns occurring over the past two years across the state.

Annual ryegrass is one of the first weeds to green up in late winter and has unfortunately gotten a head start this year with the warm winter temperatures. One essential key for successful annual ryegrass burndown is making applications within the window of the three conditions outlined in Figure 1.

Figure 1. The optimal window for Italian (annual) ryegrass burndown occurs when all three of these parameters occur at the same time.



This window capturing both the correct growth stage, air temperatures, and soil conditions has pretty much been impossible to find this year with the rollercoaster temperatures that occurred in March. While we have not been able to find the window with the correct overnight temperatures the ryegrass has continued to grow, and most has already surpassed the 6-inch heigh in our fields. Now we must capitalize on warming overnight temperatures and dry field conditions to achieve control of this problematic weed. To capitalize we must use the correct burndown tank mixtures, the following keys based on our research are essential (See Figure 2 for further data):

- Use at least 1.5lb ae/a glyphosate (40 fl oz Roundup PowerMax 3)
- The addition of 1 fl oz Sharpen (or 15 fl oz Verdict) to 1.5 lb ae glyphosate results in the consistently greatest ryegrass control in our research.
- Increasing rates of saflufenacil (Sharpen or Verdict) does not help or hurt glyphosate efficacy on ryegrass
- Avoid tank mixing glyphosate and atrazine or metribuzin as these products will antagonize glyphosate activity on ryegrass
- The best non-glyphosate mixture is Gramoxone plus atrazine or metribuzin plus 2,4-D or dicamba. These tank mixtures work best on small ryegrass and under warm sunny conditions.

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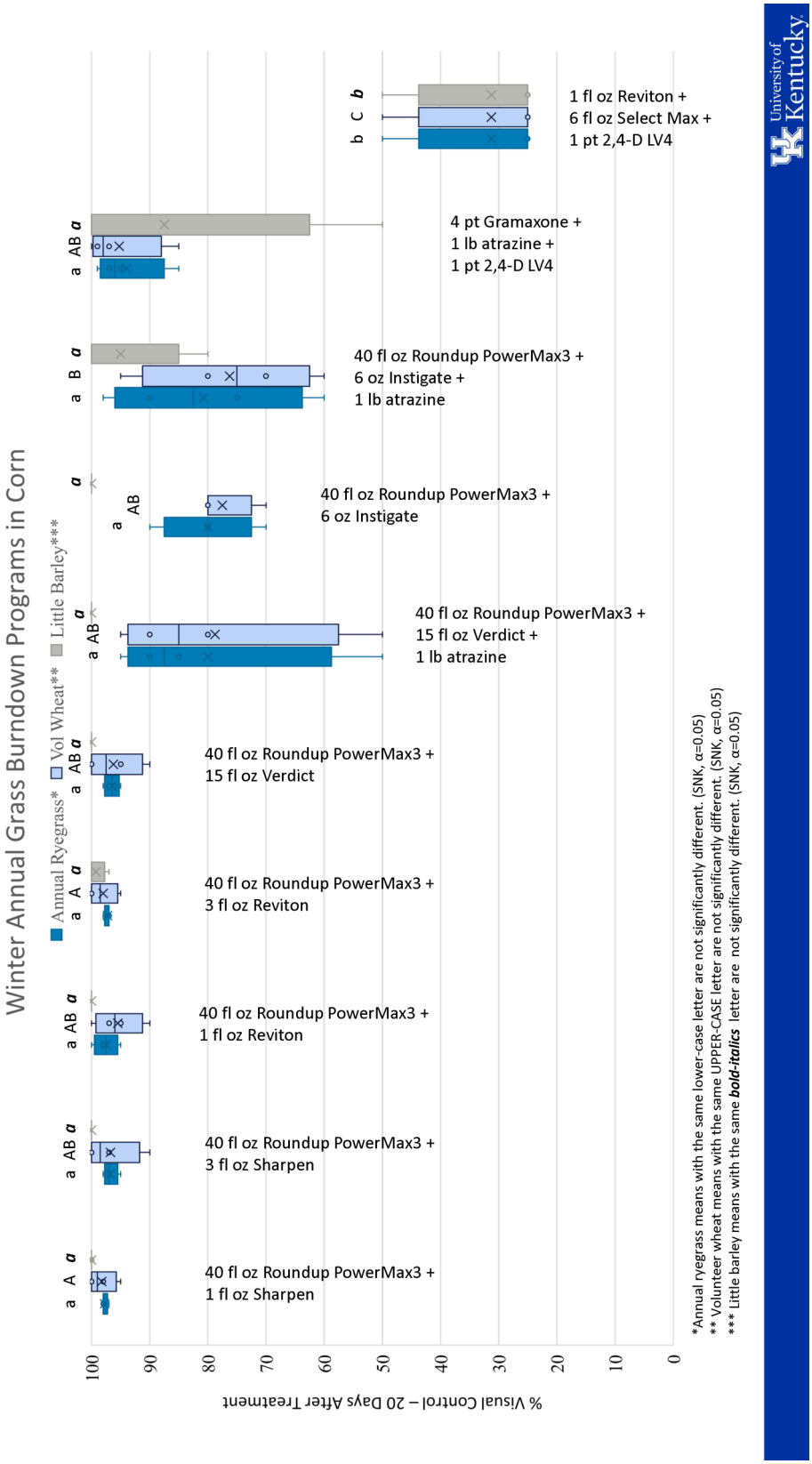
Winter Annual Grass Burndown Programs in Corn
Annual Ryegrass*
Vol Wheat**
Little Barley***
% Visual Control – 20 Days After Treatment
100
90
80
70
60
50
40
30
20
10
0
a A a
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40 fl oz Roundup PowerMax3 + 1 fl oz Sharpen
40 fl oz Roundup PowerMax3 + 3 fl oz Sharpen
40 fl oz Roundup PowerMax3 + 1 fl oz Reviton
40 fl oz Roundup PowerMax3 + 3 fl oz Reviton
40 fl oz Roundup PowerMax3 + 15 fl oz Verdict
40 fl oz Roundup PowerMax3 + 6 oz Instigate
40 fl oz Roundup PowerMax3 + 15 fl oz Verdict + 1 lb atrazine
40 fl oz Roundup PowerMax3 + 6 oz Instigate + 1 lb atrazine
4 pt Gramaxone + 1 lb atrazine + 1 pt 2,4-D LV4
1 fl oz Reviton + 6 fl oz Select Max + 1 pt 2,4-D LV4
*Annual ryegrass means with the same lower-case letter are not significantly different. (SNK, α=0.05)
** Volunteer wheat means with the same UPPER-CASE letter are not significantly different. (SNK, α=0.05)
*** Little barley means with the same bold-italics letter are not significantly different. (SNK, α=0.05)
University of Kentucky

Adjuvants

Make sure you understand what adjuvants are needed to assure your herbicide applications are effective. Adjuvants are often needed to ensure the product can effectively find its way into the weed and to its target site of action. The exclusion of an adjuvant such as MSO from a Sharpen application can be the difference in a successful and a failed burndown. You can either refer to the herbicide label or AGR-6 (http://www2.ca.uky.edu/agcomm/pubs/agr/agr6/agr6.pdf) for recommended or required adjuvants for the products you plan to apply.

Carriers

We have received a few questions about the use of liquid nitrogen as a carrier for spring burndown applications. While the inclusion of a small amount of nitrogen (such as ammonium sulfate) can be beneficial in getting herbicides into plants, larger amounts such as liquid N as a carrier may have the opposite effect. Liquid nitrogen can cause rapid plant tissue necrosis and antagonize the movement of a systemic herbicide to its target site of action allowing weeds to survive the herbicide application.

We would recommend to use water as your burndown carrier for the most effective herbicide applications. Although all water is not created equally, and we must be aware of the properties of the water we use for herbicide applications. As we start a new growing season it may be wise to go ahead and check your water sources' pH and hardness. Adjustment of water hardness and pH can be critical for successful herbicide applications throughout the season. In the challenging conditions of spring burndowns having a quality water carrier can go a long way.

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Corn Planting in 2023

Corn planting is underway in western Kentucky and the number of acres should increase rapidly this week. Most years, the weather, forecast, and soil conditions are more important than the calendar for planting corn. Generally, soil temperatures at or above 50 F for 3 to 4 days with a good forecast is acceptable for the start of corn planting. Warmer soil temperatures will encourage faster and more uniform germination and emergence. Cooler soil temperatures will delay emergence and cause more erratic emergence.

The two primary goals of planting corn are to get uniform seed depth and excellent soil-to-seed contact. All other attachments and adjustments to a planter are designed to achieve these two goals. Modern planters, sensors, and attachments greatly improve the odds of placing 28,000 to 36,000 seeds per acre into furrows with excellent depth, spacing, and soil-to-seed contact. Planting into wet soils increases the risk of sidewall compaction. Spiked-tooth closing wheels, adjustments to down-pressure, and modified gauge wheels can reduce the risk of sidewall compaction, but they do not fully overcome soil conditions.

Check seed placement often! Even with the attachments and in-cab adjustments and the monitors, nothing fully replaces getting off the tractor and checking seed placement, sidewall structure, and row closing. Taking a few minutes to check seed placement is worth the investments put into each field.

In most Kentucky soils, seeding depths of 1.5 to 2 inches is sufficient. In soils with higher sand content, seeds can be placed as deep as 3 inches. Shallower planting will prevent proper anchoring of the corn plant and could result in lodging later in the growing season. Shallower planting often leads to potassium deficiency in young corn plants. Deeper seeding depths delay emergence.

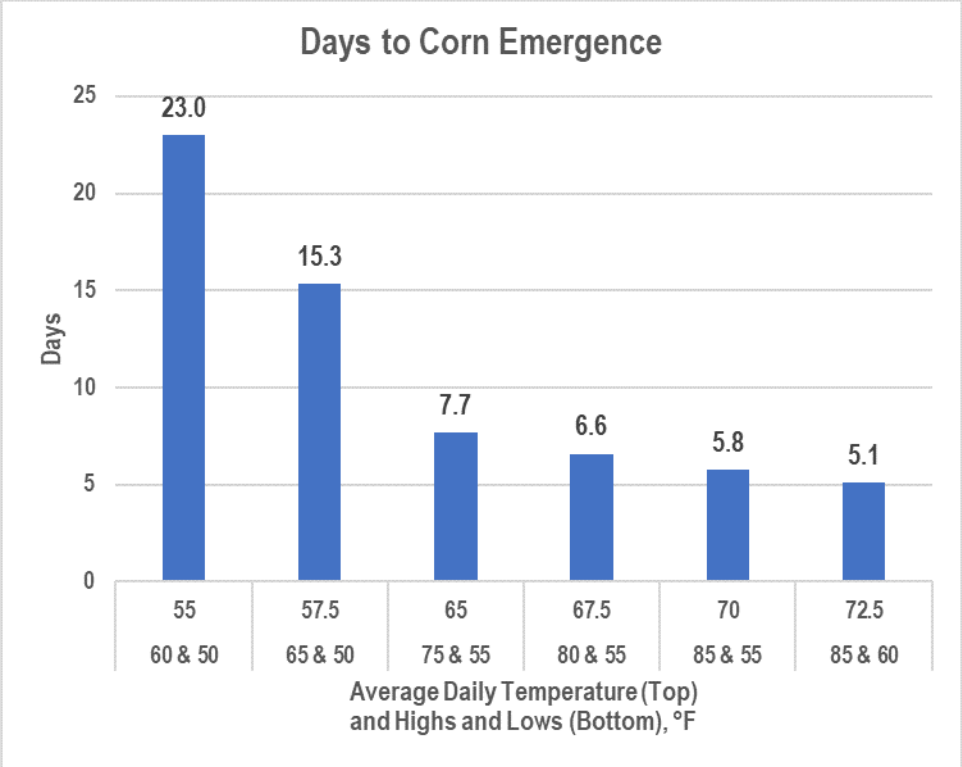

Figure 1. Days to corn emergence based on average temperatures and assuming 115 Growing Degree Days (GDD's) must be accumulated.

Rapid, uniform emergence is desired. Most farmers who have upgraded planters are doing so to improve emergence uniformity. Corn that emerges quicker usually emerges

more uniformly than corn that requires more time to emerge. Corn seeds usually need about 115 growing Degree Days (GDD's) accumulated for emergence. Warmer soils accumulate GDD's faster than cooler soils. That faster emergence usually results in more uniform emergence.

Corn will emerge in 6 days if soil temperatures average 68 F and accumulate 18 GDD's each day. Corn will emerge in 10 days if soil temperatures average 62 F and in 13 days if soil temperatures average 59 F.

For more information about planting corn, check with Chapter 5 in ID-139: A Comprehensive Guide to Corn Management in Kentucky.

Chad Lee, Ph.D.
Grain Crops Extension Specialist, Lexington
Director, Grain & Forage Center of Excel-

Grain and Forage Center of Excellence
College of Agriculture, Food and Environment

KATS
Kentucky Agriculture Training School

College of Agriculture, Food and Environment

2023
Field Crop Scouting Clinic

Ideal for agriculture interns, new and experienced producers, as well as a great refresher for others

- Corn and soybean diseases and growth staging
- Scouting for insect pests of corn and soybeans
- Weed ID
- Soil nutrients and their influence on crop growth

Credits pending

May 18, 2023

9:00 am to 4:00 pm

University of Kentucky
Research and Education Center
Princeton, KY 42445

Pre-registration is required and will close on May 16.

https://2023KATScropscoutingclinic.eventbrite.com

$105 registration fee *Lunch will be provided*

KENTUCKY Small Grain GROWERS' ASSOCIATION

For more information contact Lori Rogers
270-365-7541 ext. 21317
(lori.rogers@uky.edu)

Seed Size and Yield of Grain Crops

Advertising constantly reminds us that large is better, but does this philosophy carry over to crop seeds? Do varieties with large seeds produce higher yields?

The tremendous variation in seed size (measured as weight per seed or seeds per pound) within and among grain crops makes this an interesting and relevant question. Seeds of cereals (wheat or rice) are small (30 to 40 mg/seed or 15,120 to 11,340 seeds/pound); corn is much larger (~ 320 mg/seed or 1418 seeds/pound). Soybeans fall in between (~175 mg/seed or 2592 seeds/pound). Some grain crops have really small seeds - canola, for example, produces seeds that weigh only 10 mg apiece (45,360 seeds/pound) – and some are really large - a broad bean variety produces a seed that weighs in at 2000 mg (227 seeds/pound).

Seed size also varies among varieties within a species. Seeds of commercially available soybean varieties range in size from 150 to 200 mg/ seed (3024 to 2269 seeds/pound). While seeds of maize hybrids vary from 250 to 340 mg/seed (1814 to 1334 seeds/pound).

Does this variation have anything to do with yield? A scientist's favorite answer comes into play here – it depends! It depends on the source of the variation in size – is it genetic or environmental? Genetics controls differences among species and varieties within a species. But the environment where the seed is produced also affects size, so a varieties' seed size will vary depending upon the environment during seed filling.

Let's discuss genetic differences first. If we know why seeds are large or small, we will know if size affects yield. Seed size has no effect on yield when size is determined by seed growth rate (large seed grow rapidly, small seeds grow slowly). A seed growing rapidly - a large seed - requires more sugars per day than a seed growing slowly – a small seed. So, it takes fewer large seeds to utilize the daily supply of sugars from the leaves than small seeds. To put it another way, seed number compensates for differences in seed growth rate (seed growth rate up, seed number down) to match the supply of sugars. The total growth rate of all the seeds on the plant is the same for large and small seeds, so yield stays the same because yield is determined by the supply of sugars from photosynthesis. All the genetic variation in seed growth rate and seed size does is determine how yield is packaged.

The first breeders working with soybean in the 1930's and 40's thought they could increase yield by selecting for large seeds. They successfully increased seed size, but much to their surprise, yield did not change! The number of seeds decreased as size increased and yield stayed the same.

This compensation of size and number is clearer when we compare species. Corn produces a large seed and high yield but only a modest number of seeds per acre. Rice yields are often almost as high as corn and rice seeds are 10 times smaller than corn, but rice produces 10 times as many seeds as

corn. No one would argue that wheat is a low yielding crop, but its seeds are small and seed number is high. Yield is determined by the productivity of the plant community; genetic differences in seed growth rate and seed size are not important.

Size will be related to yield when a seed is larger because it grows for a longer time (longer seed-filling period). A longer seed-filling period gives seeds more time to use sugars from the plant to accumulate dry weight resulting in higher yield. The length of the seed-filling period is under genetic control and longer seed-filling periods exist in some varieties of soybean and corn, but they are not nearly as common as high seed growth rates. Most of the genetic differences in size are due to seed growth rate, so the best bet is to assume that genetic differences in size are not related to yield. You will be right most of the time.

Yield is almost always related to seed size when size is determined by environmental conditions when seeds are developing on the plant (during seed filling). Unfortunately, in this case, size is usually related to lower yields. Water stress or high temperatures during seed filling will shorten the period, reducing seed size and yield. We all remember years when late season drought caused early maturity (shortened the seed-filling period), resulting in smaller seeds and lower yields. If the environment improves during seed filling (it starts to rain again), seed size and yield may increase. There are physical limitations on seed size in most crop species, so the potential to increase seed size is limited. Unfortunately, the potential reductions in seed size and yield are larger than the potential increases in seed size and yield. Environmental effects have a much larger downside than an upside.

Seed size – yield relationships are complicated, but we can understand the complications if we consider the source of the variation in size. Genetic differences (variation among varieties and species) are almost always not related to yield (except in the rare case when seed-fill duration determines size), while environmental effects usually result in differences in yield.

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TOPICS INCLUDE:

Drone Regulations, Applications, and Economics
Dr. Josh Jackson & Dr. Tim Stombaugh
UK Extension Agriculture Engineers

Wheat Market Outlook
Dr. Grant Gardner
New UK Extension Marketing Specialist

UKY Oat and Rye Breeding
Dr. Lauren Brzozowski
New UK Small Grains Breeder

Wheat vs Weather: A Reoccurring Battle
Kinsey Hamby
UK PSS Graduate Student

Management of Fusarium Head Blight
Dr. Carl Bradley
UK Extension Pathologist

Wheat Agronomics
Conner Raymond
UK Grain Crops Extension Associate

Variety Trial Walk Through
Dr. Dave Van Sanford & Bill Bruening
UK Wheat Breeder & Researcher Specialist

Sustainable Management of Wheat for the Presence of Natural Enemies in Grain & Soybeans
Dr. Raul Villanueva
UK Extension Entomologist

May 9, 2023

UKREC Farm

1205 Hopkinsville St.
Princeton KY 42445

9am – noon (Central time)
Registration: 8 am

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

Lunch sponsored by:

KENTUCKY Small Grain GROWERS' ASSOCIATION

Certification Requirements for Aerial Pesticide Applications to Crops in Kentucky

There has been a high level of interest in using unmanned drones to apply pesticides to crops in certain situations. There has also been some confusion in terms of what pesticide certifications are needed to make these aerial applications in different situations. The two common situations are when a farmer wants to use a drone to apply pesticides to their fields they own or rent, or commercial applications to crops grown by others. This article addresses the state requirements for aerial pesticide applications, but there are also Federal FAA requirements that are not addressed here.

Aerial drone pesticide applications are being considered by some applicators.

There is an exemption in Kentucky that allows farmers to apply non-restricted use pesticides with ground equipment without needing to be certified. But this exemption does not apply to aerial applications, so even when applying a general use (unclassified) pesticide, the farmer applicator would need to be certified. Additionally, persons making aerial pesticide applications are required to have specialized training. This means that a Private Applicator Certification alone is not sufficient, they need to be certified as an aerial applicator. One additional consideration is that in Kentucky, the category 11 aerial application is not a stand-alone certification, it must be used with another certification that is consistent with the use of the application. So for a farmer to apply pesticides aerially to his own crops, at a minimum they would need their Private Applicator Certification and a Category 11 non-commercial license. This would help them to meet the State Laws and Regulations with respect to pesticide applications, but they would also need to meet Federal FAA requirements.

For commercial application, the Private Applicator certification will not work, instead they would need to earn their Category 1A license as well as their Category 11 Commercial Applicators license. In situations where commercial applicators are making aerial applications in forests, to aquatic areas, or along Rights-of-ways, instead of the Cat 1A, they would need to earn their Cat 2, Cat 5, or Cat 6 licenses, in those respective situations.

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Save the Date

June 29, 2023

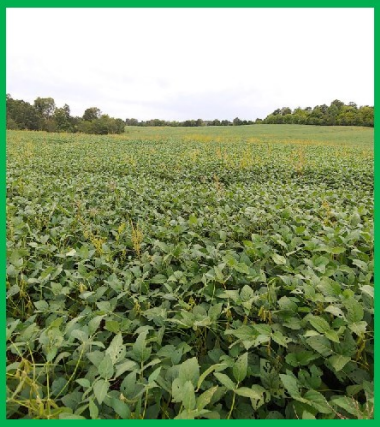
University of Kentucky

Pest Management Field Day

at the UKREC Farm

Location: 1205 Hopkinsville St., Princeton, KY 42445

Time: 8:30 a.m. CDT to 12:30 p.m. CDT — Sign-in begins at 8 a.m. CDT



Continuing education units for
Certified Crop Advisors and Kentucky pesticide applicators available

UPCOMING EVENTS

May 09, 2023	UK Wheat Field Day
May 18, 2023	KATS Crop Scouting Clinic
June 7-8, 2023	KATS Drone Pilot Certification Prep Course
June 29, 2023	Pest Management Field Day - Princeton (IPM-Grain Crops)
July 13, 2023	KATS Spray Clinic
Jul 25, 2023	UK Corn, Soybean and Tobacco Field Day

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