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Corn & Soybean News

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Fall Lime, P and K That Didn't Get Applied: Some Considerations

The wet fall and winter weather prevented lime, phosphate (P) and potash (K) applications to some Kentucky fields. As spring weather breaks warm and soils are (generally) drier, those prevented fall applications will now be done. As I write this, well drained soils are already reaching the point where they will support applicator traffic. Several questions from growers have been reported by my colleagues and this newsletter article is intended to both deal with those and anticipate others.

Lime application rates are in tons per acre, causing greater compaction hazard, which means that spring liming may be delayed an extra several days relative to fertilizer P and K applications. For a field that needed lime in the fall but did not get that lime, and though some of the fall applied lime would have reacted with soil acidity to raise soil pH prior to planting, a spring application will still be adequate to meet the needs of the next corn or soybean crop.

There are a couple of reasons that spring applied lime will meet the need. First, most Kentucky soybean and corn fields receiving a significant lime rate recommendation had a soil pH of 5.6 to 5.8. As both corn and soybean are not greatly affected by soil acidity as long as the soil pH is 5.9 or greater, spring applied agricultural lime will usually react quickly enough. Second, agricultural limes with an RNV of 50 or more contain enough limestone fines to bring about that quick reaction. Field soils with a pH lower than 5.6 should probably receive a higher quality ag lime (RNV of 60 or more). This means that pelletized lime, which is usually of very high quality (RNV of 85 or more) but costs a great deal, ***is not needed*** in these field situations.

Another thing to consider is that soil nutrients like P and K, especially P, are more plant available when the soil pH is between 6.0 and 6.5. So, should needed spring fertilizer P and K rates be raised, relative to what was recommended for fall, when liming was delayed from fall to spring? If fertilizer P and K were applied in the fall, but liming was not done, should more P and K fertilizer be applied in the spring? No, to both questions. Unlike soil P and K, fertilizers with P and K are highly soluble. When added to soil, fertilizers maintain a higher level of dissolved P and K in the soil solution – sufficient for good P and K nutrition for the next soybean or corn crop, even when growing in moderately acidic soils. However, as added P and K will react with soil minerals, becoming soil P and K with time, spring applied lime will be needed to raise soil pH to a level that best maintains soil P and K availability to subsequent crops of wheat, soybean, and corn, improving overall P and K use efficiency and return on investment.

Conversion of fertilizer P to soil P (P fixation) can be slowed by band application of fertilizer P, which reduces fertilizer-soil contact – another tool to maintain P availability in the spring while recently applied ag lime raises soil pH.

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Spring Burndown Considerations

The February snow has melted, the days are getting longer, and daytime temperatures are on the rise. This means one thing: spring is here. The winter annuals have already taken notice with many already greening up in western Kentucky the first week of March. Spring burndowns prior to corn and soybean planting will begin soon if they haven't already and while most winter annuals are controlled relatively easily with our traditional burndown, there are a few species that tend to be a pain every year.

Italian (annual) ryegrass

This species continues to climb the ranks as a troublesome weed for many Kentucky growers. This weed is a well-known pest in Kentucky wheat, but the number of complaints of failed burndowns on annual ryegrass in corn and soybean is on the rise. This weed is no longer just a wheat problem for Kentucky it is a problem in all row crops.

Annual ryegrass emerges in the fall, rapidly grows into the late fall putting on a couple of tillers, then continues to grow in the early spring. Annual ryegrass has already begun to green up and will begin rapid growth in late March and early April. The key for successful annual ryegrass burndown is all about timing. Successful annual ryegrass burndowns occur when the plants are 6" or less in height and have not started stem elongation. Additionally, it is also key to apply burndowns to ryegrass when temperatures are consistently above 45F overnight for 2 to 3 days prior to and after the burndown application. This window of time capturing both the correct growth stage and air temperatures can be difficult to find, especially when you also consider that field soil conditions need to be dry enough for sprayer traffic.

In evaluations of spring burndown options for ryegrass control in Kentucky, the following keys stand out:

- Use at least 1.5lb ae/a glyphosate (See table 1 for glyphosate rate based on formulation)
- Mixtures of 1.5 lb ae/a glyphosate plus 1 fl oz Sharpen results in the consistently greatest ryegrass control
- Avoid tank mixing glyphosate and atrazine or metribuzin as these products will antagonize glyphosate activity in ryegrass

For those dealing with ryegrass in corn the temptation is to put the burndown and preemergence herbicide on at the same time prior to corn planting. While, that has proven to be successful for the majority of acres and weed species, the inclusion of a pre-emerge herbicide that likely contains atrazine can antagonize the glyphosate. In these scenarios a farmer is better suited to apply their burndown without atrazine early in the spring and follow with an at planting application of the atrazine based residual herbicide.

Marestail (horseweed)

Another culprit that continues to be problematic for Kentucky grain crop growers is marestail or horseweed. Marestail is most troublesome due to its seemingly random emergence patterns. Marestail can emerge in the fall, early spring, late spring, as well as throughout the early summer months. While the majority of our marestail emerges in the fall or in the early spring, the continual emergence into the summer makes this species especially troublesome for soybean farmers.

The biggest key for marestail management is burndown timing, regardless of what herbicide you are using for your burndown making applications to small rosette stage marestail is critical. The wide range of emergence timing for marestail means every field is likely to have different stages of marestail. Fields at the UKREC with heavy winter annual pressure that were scouted on March 1, 2021 (Photo 1) had marestail plants that were only 1 to 2 inches in rosette diameter, while other fields on the research farm with light winter annul infestations had rosette marestail plants up to 8 inches in diameter (Photo 2). Scouting now is key to identifying fields that need earlier burndowns to achieve optimal marestail burndown.

Photo 1

Photo 2

In the scenario of a field having overall heavy and diverse infestation of winter annual weeds (such as in Photo 1), it is easy to overlook the small marestail plants that often occur underneath the large pennycress and cressleaf groundsel plants. The temptation may be to simply apply glyphosate as it can efficiently control all of the winter annual weeds that are easy to see when scouting from the road. In these scenarios the glyphosate will kill all the winter annuals except the marestail and by soybean planting the field will be overgrown with marestail. It is always important to scout the entire field and not only account for the obvious weeds, but those that may be hiding underneath.

Scouting now is key to understand if marestail is present and what growth stage the marestail is at; and then determine the priority of fields for spring burndowns to maximize marestail control.

Overall, we have found the following burndowns to be most effective for marestail:

Glyphosate (1 to 1.5 lb ae/a) plus Sharpen (1 fl oz/a)

Glyphosate (1 to 1.5 lb ae/a) plus Dicamba (0.25 to 0.5 lb ae/a)

Glyphosate (1 to 1.5 lb ae/a) plus 2,4-D (0.7 to 1 lb ae/a)

Glyphosate (1 to 1.5 lb ae/a) plus Elevore (1 fl oz/a)

Liberty (29 to 36 fl oz/a)

The recent introduction of Enlist E3 and RR2Xtend/RR2XtendFlex soybean varieties has greatly increased the flexibility of 2,4-D and Dicamba for burndown applications in front of soybean planting for effective marestail control. Farmers using either of these soybean systems in fields with marestail are encouraged to take advantage of this flexibility and use these effective growth regulators for spring burndowns.

Fields of Yellow and Purple

No-till field have started to green up the past week or two and many will be transitioning to hues or either purple or yellow. The yellow fields are likely either infested with a mustard species or cress leaf groundsel and the purple fields are infested with either purple deadnettle or henbit and in many cases, both. These fields also may contain many other common winter annuals such as field pennycress, shepardspurse, fleabanes, and chickweeds.

Luckily many of these weeds are fairly easily controlled with combinations of common burndown products such as glyphosate, paraquat, 2,4-D, and Dicamba. Often these field are allowed to go unmanaged well into the spring/early summer until just prior to soybean planting due to the high effectiveness of burndown herbicide on these species. Despite the confidence of this trend, it should be noted that it can be beneficial to burndown earlier in the spring to allow for quicker soil warming and drying for earlier optimal planting conditions. There are a number of ALS-inhibitor based residual herbicides that can be applied as an early burndown up to 30 days prior to soybean planting. When mixed with glyphosate, paraquat, 2,4-D, or dicamba these products can provide an effective burndown and also keep the field relativity clean of early emerging summer annuals and late emerging winter annuals up to crop planting. A list of these products and planting time restrictions can be found in Table 2. It should be noted that these products do not replace in-season residual herbicides for problematic summer annuals, but rather assist in keeping fields clean from early burndown up to crop planting.

Table 1. Glyphosate product formulations and equivalent use rates to achieve outputs of 0.75, 1.13, and 1.5 pounds glyphosate acid equivalent per acre.

Example Product(s)*	Formulation *lb ae/gal***	Rate Equivalents		
		0.75 lb ae/a	1.13 lb ae/a	1.5 lb ae/a
Buccaneer, Cornerstone Plus, Mad Dog	3	32 fl oz	48 fl oz	64 fl oz
Durango DMA, Conerstone 5 Plus, Credit 5.4 Extra	4	24 fl oz	36 fl oz	48 fl oz
Abundit Edge, Credit Xtreme	4.5	22 fl oz	32 fl oz	44 fl oz
Roundup PowerMAX 3	4.8	20 fl oz	30 fl oz	40 fl oz

* A complete list of glyphosate products can be found on page 21 of the 2021 edition of AGR-6
** Glyphosate in pounds acid equivalent per gallon

Table 2. Early spring ALS-inhibitor residual burndown herbicides that can be tank mixed with glyphosate, paraquat, 2,4-D, and/or dicamba for control and suppression of early emerging summer annuals and late emerging winter annuals up to planting.

Herbicide	Active Ingredients	Use Rates	Plant Back Restrictions	
			Soybean	Corn
Canopy EX	chlorimuron+ tribenuron	1.1 to 3.3 oz/a	1.1 to 2.2 oz/a – 7 days >2.2 oz/a – 14 days	10 months
First Shot	thifensulfuron + tribenuron	0.8 oz/a	7 days	14 days
Leadoff	rimsulfuron + thifensulfuron	1.5 oz/a	BOLT Soybean- 0 Days Soybean without BOLT -30 Days	0 days
Crusher	rimsulfuron + thifensulfuron	1 oz/a	BOLT Soybean- 0 Days Soybean without BOLT -30 Days	0 days

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Mid-South Soybean Variety Trial Database Survey

Soybean growing regions often cross state lines but variety trials information is typically reported by state. To provide stakeholders with a clearer picture of variety performance, a project is underway to develop a web-based soybean variety testing database that allows end-users to summarize and filter yield, quality, and phenotypic data based on location characteristics that cross multiple states. This project, the development of a Mid-South Soybean Variety Trial Database, is performed as a collaborative effort from the University of Tennessee, University of Kentucky, Virginia Tech, NC State, and University of Arkansas, and is funded by the United Soybean Board. Input from those involved in soybean production (growers, seed industry, applied research, Extension, crop advisors) is extremely important for developing a product that best meets the needs of stakeholders.

If you are interested in providing inputs for this research project, please participate to the survey located at: **soybeandatabase.questionpro.com**. Participation is voluntary, and responders must be 18 years old or older.

If you have questions, please contact Dr. Virginia Sykes at **vsykes@utk.edu**.

KATS schedules variety of programming for 2021

The Kentucky Agriculture Training School (KATS) is making plans for 2021! Covid caused most of the trainings in 2020 to be cancelled, however, it looks promising for us to hold in-person trainings this year. Covid safety measures will be followed and we will announce more details closer to each event.

May 6: Crop Scouting Clinic (Option 1)

May 20: Crop Scouting Clinic (Option 2)

June 15: Forage Workshop

July 15: Spray Clinic

Also being planned (dates and more information TBD):

-Self-Led Educational KATS Plot Tour.

-Developing Management Zones for Soil Sampling-This will be an online interactive event that will take place over the 3 different times slots.

The schedule and training information can also be found at kats.ca.uky.edu and will be updated accordingly. If you have questions or would like to be added to the email list, contact Lori Rogers at **lori.rogers@uky.edu**.

Corn fertilizer timing strategies: Starter, pop-up, relay, lions, tigers, and bears…oh my!

We have a few minutes before planters start rolling for #Plant2021 in Kentucky. So, this is a perfect time to think about your early season corn fertilizer strategy. First, when managing phosphorus (P), potassium (K), and soil pH, soil testing is your best bet. We tend to think of the less mobile nutrients, like P and K, as relatively unaffected by timing of application. For the most part this is true; we can apply P and K in the fall or winter when the ground might be drier, and we have less to do. However, there is always some benefit to applying nutrients closer to the time when crops need them. Phosphorus forms strong bonds with iron and aluminum minerals in acidic soils and the longer that the P reacts with these soil components the stronger those bonds become making it less available to the plant. In addition, runoff from fields is generally higher over the winter when soils are wetter and the risk of nutrient losses in runoff increases. With nitrogen (N), timing is of the utmost importance. Of all the strategies to increase N uptake, minimize loss, and maximize efficiency, timing management is most important. There are many additives on the market that claim to increase N efficiency, and a few do (under certain conditions), but the gains that can be achieved by spoon feeding N to your corn crop far outweigh any potential benefit achieved via these products. So, what role do starter, pop-up, or other at-planting fertilizers play in nutrient management?

Starter fertilizer is a broad term generally used to cover any fertilizer applied close to the seed in relatively small amounts at the time of planting. However, with precision guidance technology and new styles of application equipment we can now use equipment other than our planters for the same effect. A few years back when we talked about starter applied with the planter, we were talking about 2 by 2, "pop-up," or surface band. Now, there are other options like 2 by 2 by 2, pulsed fertilizer in the furrow, or even "relay."

Starter fertilizers fall into two broad placement categories, in-furrow and offset. In-furrow, or "pop-up" as it is commonly called, is placed directly in the furrow with the seed and can also be referred to as seed-row fertilizer (Figure 1).

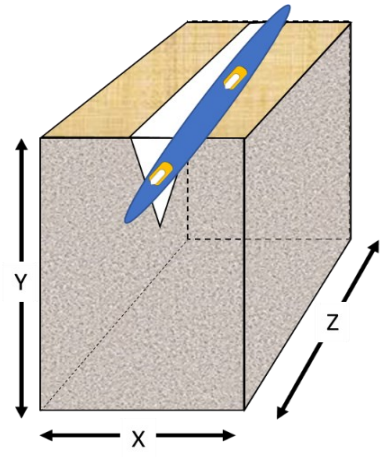


Figure 1. In-furrow, pop-up, or seed-row fertilizer is placed in the furrow with the seed.

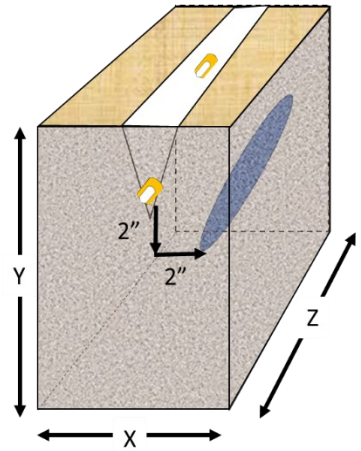


Figure 2. Fertilizer banded 2-inches to the side and 2-inches down from the seed, commonly called 2 by 2, is type of offset fertilizer application.

Figure 3. No-till corn planter with coulters for offset or 2x2 application provides an effective means to get N under surface residue.

Offset fertilizer is just what it sounds like, it refers to placing the fertilizer offset from the seed row. The most common offset placement is probably 2 by 2, where a fertilizer band is placed 2-inches to the side and 2-inches below the seed (Figure 2). This is achieved with a fertilizer coulter offset from the row openers (Figure 3). The newer 2 by 2 by 2 placement offers a similar approach but a band of fertilizer is placed on each side of the seed furrow. Some of the newer equipment, particularly with 2 by 2 by 2, does not technically place the fertilizer 2-inches below the seed as shown in Figure 2. Instead, they place the fertilizer closer to the surface, often at the same depth as the seed.

Pulsed fertilizer provides a new approach to in-furrow starter fertilizer. A pulsed system is triggered by seed drop and the same aerial or per acre rate is applied but in shots divided equally per seed. Every time a seed drops a pulse of fertilizer is shot into the furrow. The user can set the system to deliver the pulse directly on the seed or a set distance behind the seed. We are currently testing this approach at the University of Kentucky to evaluate potential risks and rewards. Another term that might be new to some of our users is "relay," which refers to a combination of both offset and in-furrow fertilizer.

Figure 4. Salt damage can be terminal as in the bottom left or delay emergence as seen in the top right. Even plants that emerge in a timely fashion can appear to suffer from various nutrient issues due to root damage.

Let's take a look at in-furrow techniques first. The term pop-up comes from the belief that placing a small amount of fertilizer with the seed contributes to quicker emergence, but this is rarely the case. In fact, the opposite can often be true. Even when the final emerged stand is not affected, emergence is typically slower when an in-furrow or pop-up fertilizer is used – soil temperature, texture, and moisture all play a role how long emergence is delayed and how much damage occurs. Let's review what's happening in the furrow when we place fertilizer with the seed. Generally, we use liquid fertilizers, which are salty solutions. Placing a salt in the soil creates an osmotic potential. If you put pure water on one side of a semipermeable membrane that allows water to pass across the membrane, but not salt, and you then put salt in the water on the other side of the membrane, you create osmotic pressure. The pure water moves towards the salt to balance the salt concentration on both sides of the membrane. Too much salt placed close to seed or roots causes plasmolysis, where water moves out of seed or root cells towards the salt and the cells collapse. If you dig up corn seeds with spotty emergence and they look like raisins, you've more than likely got a salt issue (Figure 4).

Because of the risk to the seed and emergence, in-furrow fertilizer rates must be kept very low, even with low salt fertilizers. As a result, in-furrow fertilizer only provides an advantage when total nutrient requirement is very low. For example, if you apply 6 gallons/acre of 10-34-0, which is more than I would recommend applying in-furrow, you are only supplying 7 lb/acre N and 23.8 lb/acre P_2O_5. Using a low salt fertilizer like 6-24-6 at the same rate would only supply 4 lb/acre of N and K2O and 16 lb/acre P_2O_5. If you plan to sidedress at V4 or later, we recommend you apply at least 20% of your expected N requirement at or before planting, clearly an in-furrow application couldn't be used to supply this much N.

A relative newcomer to the in-furrow fertilizer technique is pulsed. In 2020 we put out our first trials to evaluate this technique, so we don't have much to report at this time. However, it's worth mentioning how pulsed fertilizer works and some potential concerns as well as benefits. The system squirts a pulse of fertilizer using a solenoid nozzle that flashes open triggered by the seed drop. The length of the pulse of fertilizer in the soil is a factor of planter speed, population, pump pressure, and fertilizer rate. For example, if you were running your planter 4 mph, dropping 38k seeds/acre on 30-inch rows, with 40 psi pump pressure, and trying to hit 6 gallons/acre of 10-34-0 with a pulsed system produced by CapstanAG™ you would be putting down a pulse of fertilizer measuring 1.7 inches in length. Because it is a pulse, the head of the fertilizer pulse is a higher rate than the tail. You can choose how far the fertilizer pulse is located from the seed. You could center the pulse on the seed or pick a set distance after the seed to place the pulse. One of the drawbacks of offset fertilizer is that it typically requires a separate fertilizer coulter, which is a turnoff to many producers. Pulsing the fertilizer might provide an effective method to get fertilizer down at planting at a reasonable rate, without putting it on the seed, and without the extra coulters. Alternatively, you could use the pulsed system to put a high dose right on the seed, but with a lower per acre rate – saving on fertilizer cost. We are evaluating both of these approaches to see if there are advantages.

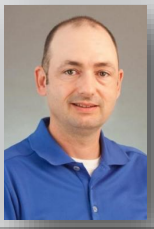
As a cautionary note, it's useful to compare the rate the seed would see with a continuous application in-furrow and a pulsed application. If you used the same speed and population settings as above and applied 6 gallon/acre of 10-34-0 in a continuous application you would be applying about 0.06 mg/cm of fertilizer, but pulsed you would be applying about 0.19 mg/cm. That pulsed rate would be the same as a continuous in-furrow application of 19.5 gallons/acre, which would SMOKE your seed! I would not recommend putting the pulse on the seed, but perhaps you could offset it from the seed. At a population of 38k your seeds would be spaced 5.5-inches apart so you could start that pulse 2.8-inches from the seed (the same distance achieved with 2 by 2 shown in Figure 2) and the tail, which would have a much lighter rate, would still be about 1-inch from the next seed. We are about to kick off our second field season testing this technology, hopefully this time next year we will be able to give more concrete advice on its implementation.

Offset placement, like 2 by 2, places the fertilizer band 2 – 3 inches from the seed. This avoids the delayed emergence or salt damage problems seen with in-furrow applications, as long as you keep the total salts low. Most research shows that your seed will be safe if you keep the combined N plus K_2O rate below 100 lb/A on heavier soils and below 50 lb/A on lighter soils. We're finding that with heavy cereal cover crops, like rye, we need more N upfront and it's probably better if we get that N below the soil surface. In these no-till systems, particularly if they're no-till, the organic residues tie up the N. Applying 25 – 50% of your total planned N rate using 2x2 coulters is a great way to avoid this (Figure 3). So, if you're shooting for 200 lb N/A for your corn you could easily apply 50 – 75 lb N/A as 32% UAN, at planting, through an offset system like the one in Figure 3. This would allow you to come back in with a sprayer and drop hoses or a high clearance dry fertilizer spreader and apply the remaining 125 – 150 lb N/A between V5 and V8. You can even watch the weather and crop progress and adjust based on what you're seeing.

If you're putting down offset fertilizer there's probably no need to invest in expensive low salt fertilizer because the three-inch separation decreases delayed emergence problems. If you're planning to go in-furrow you want to look for the more expensive low salt products. For comparison, a low salt choice like 6-24-6 has a salt index of 11.9, ammonium polyphosphate (10-34-0) jumps up to a salt index of 20, and 7-21-7 hits 27.8. You never want to put 32% UAN in-furrow – not only does this UAN have a salt index of 71.1, but it also can generate ammonia which can damage seeds. However, UAN is fine in an offset application like 2x2 at reasonable rates as dis-

cussed above. Even with a low salt product, delayed emergence or uneven emergence can be a problem when placed in-furrow. The longer the seed sits before germinating the worse this problem becomes, so if you use an in-furrow fertilizer and you have a cool spring or dry soils your problems will be worse than if you have warm temperatures that encourage germination.

At the end of the day, it's important to remember you will probably not get a yield response to starter fertilizer if your soil test says you don't need fertilizer. If your soil test recommends P, starter can be an economical way to deliver a lot more bang for the buck. Some sources indicate that you can deliver the same yield benefit to P deficient soils with half the rate of P recommended as surface broadcast fertilizer. If your soil test comes back at optimum or better, the probability you will see a return on a starter fertilizer investment is very low. Likewise, adding extra N above what the crop needs through a starter application will not add extra yield. Nitrogen requirement is determined by yield and N loss. You are reducing N loss if you switch from all N going down preplant to a starter plus sidedress strategy. If you see a yield gain due to this switch it's not because starter increased your yields, it's because you decreased your losses. In other words, you were shorting your crop with an all-preplant strategy. Starter fertilizer is not a magic pill – it just provides needed nutrients in a highly available form and placed for optimum early access by young seedlings.



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Useful Resources

KyGRAINS.info

College of Agriculture, Food and Environment

WHEAT SCIENCE GROUP

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

Kentucky Pest News

Entomology · Plant Pathology · Weed Science

http://kentuckypestnews.wordpress.com/

Crops Marketing and Management Update

KATS

Kentucky Agriculture Training School

2021 Upcoming Events

Date	Event
May 6	KATS – Crop Scouting Clinic (Option 1)
May 11 & 18	2021 Virtual Wheat Field Day
May 20	KATS – Crop Scouting Clinic (Option 2)
June 15	KATS – Forage Workshop
June 29	Pest Management Field Day
July 15	KATS –Spray Clinic
July 22	UK 2021 High School Crop Scouting Competition
July 27	2021 Corn and Soybean Field Day
TBA	KATS – Developing Management Zones For Soil Sampling (online, interactive)
TBA	KATS – Self-Led Educational KATS Plot Tour (in person)

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