1. Using starter P fertilizer for wheat

Wheat can be as responsive as corn to starter P fertilizers, especially when soil P levels are low or very low. The probability of wheat response to starter fertilizer P decreases as P soil test levels increase above 20 ppm – but responses are still often noted.

Soil test values are a good guideline for predicting how much response, if any, wheat will have to applied fertilizer, but other factors also influence the nutrition of the wheat crop and response to fertilizer. Nutrient uptake by the crop also depends on other factors, such as root system development, soil moisture status, soil temperature, compaction, and so forth.

One big difference between the use of starters for wheat and corn is that options for placement of the starter fertilizer is often more limited with wheat due to the narrow row spacing. With corn, starter fertilizers are often knifed in to the side of the seed (e.g. in a 2x2 placement), with some soil separating the seed from the fertilizer. Starter fertilizers for corn may also be dribble applied to the soil surface at planting. High rates of nitrogen (N) and potassium (K₂O) can be included in the starter fertilizer this way since the fertilizer does not come in direct contact with the seed.

Starter placement options with wheat are more limited. Wheat is planted with a drill, typically using a row spacing of 12 inches or less. It’s hard to place starter fertilizer below and to the side of the seed with narrow row spacings. As a result, starter fertilizer for wheat is most commonly put down directly with the seed.

When placing starter fertilizer in direct contact with wheat seed, producers should use the following guidelines:
<table>
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<tr>
<th>Suggested Maximum Rates of Fertilizer to be Applied Directly With Wheat Seed</th>
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<tr>
<td><strong>Pounds N + K₂O (No urea or UAN)</strong></td>
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<tr>
<td><strong>Row Spacing (inches)</strong></td>
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<tr>
<td>15</td>
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<td>10</td>
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<td>6-8</td>
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No urea-N (which includes dry urea or liquid UAN fertilizer) should be added to the starter if the fertilizer is applied with the seed. No-till producers may want to “spike” their starter fertilizer with extra N from urea or UAN in order to apply as much N as possible below the soil surface at planting time. This is not recommended since germination damage and reduced stand establishment may result.

The problem is that urea is initially converted to ammonia and may be toxic to plant roots if the wheat seed is placed in direct contact with the fertilizer. Producers may hear of someone who has placed urea in direct seed contact and seemed to have no problems, but there are also many cases where urea containing N fertilizers has injured the developing seedling and reduced or delayed emergence significantly. The risk of injury is greater in drier soils and at higher N rates. There is significant risk associated with placing urea containing fertilizers in direct seed contact.

Air seeders that place the starter fertilizer and seed in a band an inch or two wide, rather than a narrow seed slot, provide some margin of safety because the concentration of the fertilizer and seed is lower in these diffuse bands. In this scenario, adding a little extra urea containing N fertilizers to the starter less likely to injure the seed - but it is still a risk.

Phosphorus fertilizers commonly used for starter application to wheat are liquid 10-34-0, 18-46-0 (DAP) or 11-52-0 (MAP). All of these products perform similarly at equal rates of P application and if applied in a similar manner. In a conventional starter setup on drills, these fertilizers are applied directly in the seed slot.

In addition to conventional liquid and dry starter setups for wheat drills, another good way of applying starter fertilizers for wheat is to blend dry DAP or MAP directly with the seed. The N in these fertilizer products is in the ammonium-N form, not the urea-N form, and is much less likely to injure the wheat seed, even though it is in direct seed contact. If DAP or MAP is mixed with the seed, the mixture can safely be left in the seed hopper overnight without injuring the seed or gumming up the works.

“Green” DAP and MAP, (from western phosphate production sites) tends to work a little better when mixed with the seed than “brown” or “gray” DAP and MAP originating from Florida. This is simply because the “green” fertilizer typically has had far less handling than Florida product (loading, unloading, transportation, distribution points, barges, etc.),
so has fewer fine particles, which sometimes cause bridging problems in the drill box. Agronomically, the products are equal.

Dual-placement of N and P (anhydrous ammonia or UAN plus 10-34-0 applied in the same band below the soil surface) is a fertilizer application method usually used in preplant applications. Ammonium-N has long been known to increase P uptake by crops, and dual-placement can be very effective. Sometimes, producers will use this method at planting time, trying to position the band to the side of each row of wheat seed. Use caution, however.

If adequate separation of fertilizer and seed is accomplished, this is a good method of application that fits into many farmers’ overall no-till system. If adequate separation of the ammonia/UAN and seed is not accomplished, wheat germination/stand establishment can be severely affected. With some application equipment, anhydrous ammonia is metered and applied as a liquid as it is banded with the 10-34-0 fertilizer. Liquid ammonia likely will initially expand less in the soil than traditional gaseous ammonia application - and as a result, liquid ammonia could be placed a little closer to the seed. However, it is still ammonia that is being applied and it cannot be placed in direct seed contact.

Although the response of wheat to starter fertilizer is primarily from the P, the small amount of N that is present in 10-34-0, DAP, or MAP may also be important in some cases. If no preplant N was applied, and the soil has little or no carryover N from the previous crop, then the N from these fertilizer products could benefit the wheat, in addition to the P.

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2. Nitrogen management in no-till wheat

It’s not uncommon, unfortunately, to see no-till wheat that is nitrogen (N) deficient. Too many producers either do not apply enough N to no-till wheat, apply all or part of it too late to be effectively utilized, or use an inefficient method of application. All of these factors can lead to N deficiency in no-till wheat.

There are several important N management considerations with no-till wheat. Here is a brief summary of a few considerations:

* For highest N use efficiency, knife/band applications of N below the soil surface are always preferred since placing N below the soil surface minimizes N immobilization (tie-up in residue), eliminates the potential for volatilization loss, and physically places the N in the area of the soil most likely to have active, feeding roots. If knifing/banding N fertilizers is not an option, surface dribble N applications are preferred over surface
broadcast applications. Broadcast N application provides the greatest flexibility to the grower (producers can mix herbicide with UAN, special equipment is not needed, etc.), but will require more attention to environmental/soil conditions at application.

* Previous crop residues should be as evenly distributed across the field as possible. Uneven distribution of previous crop residue is the cause of many no-till problems, including immobilization of surface applied N and poor stand establishment/root development.

* No-till wheat production systems generally require about 20-30 lbs/acre more N than wheat planted on tilled ground. A higher percentage of the applied N in a no-till system compared to conventional or reduced-till systems may be immobilized by decomposing residue on or near the soil surface, which would lower N use efficiency for that year. This is especially true when the N is surface applied.

Also, the presence of large amounts of crop residues increases the potential for urea-N volatilization from surface applied urea containing N fertilizers. Volatilization loss from urea containing N fertilizers can occur when they are surface-applied to warm, moist soils that are beginning to dry out on the surface. Urea is very water soluble and is easily moved in the soil (incorporated) with precipitation. Surface residues provide shading of the soil surface which often increases soil moisture at the surface, as compared to conventional tillage systems. As a result, it is important for producers to more closely manage urea-containing fertilizers by avoiding surface application to warm, moist soils. Winter application is much better.

Finally, higher soil organic matter levels in no-till may increase the need for N fertilizers. Soil organic matter levels typically increase very slowly under continuous no-till conditions. Since soil organic matter contains about 5% N, any increase in soil organic matter over time will require an investment of N above the amount required for crop growth and development. It is possible that as the continuously no-tilled fields reach a new equilibrium after many years of no-tillage, the need for additional N may diminish.

* If the no-till wheat is planted immediately after grain sorghum or sunflowers, then producers will have to add another 30 lbs N per acre to their total (in addition to no-till adjustment).

* If most or all of the N is to be topdress-applied, this should be done in the late fall through early winter time period (November through February). Waiting until March for topdress applications carries significant risk. Nitrogen that is topdress-applied needs to receive enough precipitation to move it into the root zone of wheat prior to jointing stage. If the N is applied too late, conditions are dry, and adequate precipitation is not received after application, the surface-applied N will not be available in the root zone of the plants and the crop may be N deficient at jointing despite the topdress application. All of the N should be applied early enough to be in the root zone by jointing.
Producers should not try to spike their starter fertilizer with extra N from urea or UAN. This applies to any tillage system, but this practice is most tempting to no-till producers who want to get as much of the N as possible applied below the soil surface. Urea containing N fertilizers can injure the wheat if it is placed in direct seed contact.

For well-drained, medium-fine textured soils, some or all of the N can be applied preplant or topdress-applied in late fall through winter, unless the soil conditions are unfavorable. For wheat production in Kansas on these soils, preplant N applications have performed very well. Winter topdress applications have also generally performed as well as preplant application on these same soils, but they have not been better in most cases. A very good approach for wheat on these soils may be to apply some of the needed N preplant and then top off N needs with winter topdress applications, adjusting the rates as needed to account for grazing or grain yield potential. We have not seen yield response to additional split applications in the spring on the well-drained, medium-fine textured soils common across Kansas.

For shallow, claypan soils in southeast Kansas, and on other poorly drained soils across the state, winter topdress applications are generally preferred to fall applications since wet, waterlogged soil conditions can result in significant denitrification loss. For sandy soils, delaying most of the needed N until winter topdress is frequently better than preplant N application, since significant overwinter leaching can occur during wet years.

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3. K-State Performance Tests in transition to new coordinator

Jane Lingenfelser has accepted the position as Coordinator of the Kansas Crop Performance Tests. Jane received her BS (1998) and MS (2001 - Plant Breeding) degrees from the Department of Agronomy at Kansas State University. She currently is working as an Associate Scientist in the Department of Grain Science and Industry. Lingenfelser’s experience managing the Grain Quality Lab and service in the Wheat Quality and Analytical Lab has included work with independent food-corn hybrid performance tests and support of KAES wheat breeding efforts.

Lingenfelser will take over coordination of the Kansas Crop Performance Tests on August 28. Meanwhile, she is beginning the transition by working with Kraig Roozeboom to put together the fall wheat and alfalfa test plantings and to prepare for harvest of the corn and sorghum tests. Please continue to direct questions and information about the performance tests to Kraig Roozeboom until August 25. Beginning August 28, Lingenfelser will be the primary contact for the Kansas Crop Performance Tests.

-- Steve Watson, Agronomy e-Update Editor
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These e-Updates are a regular weekly item from K-State Extension Agronomy. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader 785-532-0397 jshroyer@ksu.edu