SPRING NITROGEN FERTILIZER APPLICATIONS

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Perhaps you did not get planned nitrogen (N) applications accomplished last fall. Or you are pondering what the spring 2020 weather conditions might be – another wet spring? Are you are considering use of different products; if so how should they be handled?

Preplant applications

Urea, urea-ammonium nitrate solution (UAN), and other products

Fertilizers such as urea and UAN solution can be broadcast and incorporated with normal tillage before planting. Incorporating or injecting rather than leaving the fertilizer on the soil surface can prevent volatile N loss from granulated urea or urea in UAN as it converts to ammonium, or reduce runoff if a rapid rainfall (or snowmelt) event occurs. If time is critical and UAN application is made with preemergence herbicides, then surface application is an option, although increased risk due to potential volatile loss from the urea remaining on the soil surface (especially in no-till). A rainfall of at least 0.25 to 0.50 inch within approximately two days after application will eliminate volatile loss concern. UAN is half ammonium nitrate and half urea, therefore volatile loss potential from UAN is half of that with urea. Banding UAN on the soil surface will also reduce volatile loss to about half that with broadcast application. Predicting the amount of volatile N loss is difficult, but loss increases with high surface crop residue (especially no-till), moist soils that are drying, warm soil temperatures, many days without rainfall, high soil pH, low soil cation exchange capacity, and higher N application rates. Although an added cost to decrease risk of volatile loss, a urease inhibitor can be added to slow urea conversion which provides time for rainfall to move urea into the soil. Preplant or preemerge applications can be part of a weed-and-feed or split-N system, with a full N rate or rate to supply part of the total N application needed and the remainder applied sidedress.

Another fertilizer option is polymer coated urea, designed to delay urea release until soils warm. To avoid product runoff, incorporate into the soil. Surface broadcast options, especially adapted to no-till, include ammonium nitrate and ammonium sulfate. These granulated products are either not used extensively in Iowa, or not typically used for main N applications, so there may be limited availability. Nitrification inhibitors, designed to slow conversion of ammonium to nitrate, have not shown adequate yield response in Iowa research when spring applied to justify use with ammonia, urea, or ammonium containing fertilizers.

If disturbing soil is a concern in no-till from injecting N, then broadcast application is an advantage. However, it also has the disadvantage of potential volatile losses from urea, surface runoff, or immobilization of N with surface residue, and is not a highly recommended application.

Anhydrous ammonia before planting

Anhydrous ammonia has specific considerations. It must be injected, and the ammonia band will initially have high pH and considerable free ammonia which can damage corn seedlings and roots. There is no exact “safe” waiting period before planting, and injury can happen even if

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planting is delayed for a considerable amount of time. The risk of ammonia injury depends on many factors, with several that are not controllable. Risk increases if application is made when soils are wet and then dry (allowing ammonia to move up the injection track after application), with higher application rates, when soils with high clay content are wet (sidewall smearing of the injection track and ammonia moving toward the soil surface during application), and when soils are very dry and coarse textured (ammonia movement resulting in a larger band). A few management practices can reduce the risk of ammonia damage. Wait to apply when soil conditions are good, have a deep injection depth (6-7 inches or more), and wait several days until planting. If the injection placement relative to future corn rows can't be controlled, apply at an angle to reduce entire sections of corn rows from being damaged. If the injection track can be controlled with GPS guidance, then offset a few inches from the future corn rows – with this guided system no waiting period is needed. There is a similar free ammonia or salt issue with shallow banded urea or UAN solution. Anhydrous ammonia nitrifies more slowly than products like urea or UAN solution, so it is a preferable preplant fertilizer for soils with greater potential for losses in wet conditions.

Split/sidedress applications

There is a wide time period for split/sidedress applications. Sidedress injection can begin immediately after planting if corn rows are visible or GPS guidance is used. Be careful so that soil moved during injection does not cover planted rows or small corn plants. It is easiest to inject in the middle between rows and there is no advantage in attempting to place the injected band close to the corn row. Corn roots will reach into the inter-row at an early growth stage. Injected N can also be applied between every other row, and this will provide equivalent response as when placed between every row. Compared to preplant application, split/sidedress has greatest chance of improved response on soils with high leaching potential (sandy soils) and poorly drained soils prone to excess wetness and ponding.

For many soils, when planting after soybean there can be adequate N in the root zone to meet the needs of small corn plants. In wet and cool springs, where soil nitrate levels and mineralization rates are low, to avoid early N stress there should be a preplant or planting time N application. This is especially important for corn following corn, where there is a greater likelihood of low soil nitrate and added N is needed for early growth. Preplant or starter N can help meet early plant needs, and is especially important if sidedressing is delayed significantly or planned mid- to late-vegetative growth stage application.

With sidedressing, a urease inhibitor with surface applied and non-incorporated urea and UAN could help reduce volatile loss, similar to that described above with preplant applications. A dry soil surface may be more common within the growing season, which will reduce volatile loss potential. The rate of N applied, and the amount of potential N loss, has to be large enough to offset the inhibitor cost. Rainfall will eliminate volatile loss and is needed to move surface applied N into the root zone.

Broadcasting granulated urea, ammonium sulfate, or ammonium nitrate across growing corn can cause leaf spotting or edge browning when fertilizer granules fall into the corn whorl. Damage

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will be greatest with ammonium nitrate, but that product is not readily available in Iowa, and damage from ammonium sulfate is greater than with urea. The chance of damage increases with larger corn and higher application rates. As long as the fertilizer distribution is good, not concentrated over plants, and the rate reasonable, the leaf damage should only be cosmetic.

Broadcast application of UAN solution across growing corn has the potential to cause significant leaf burn and reduced early growth. Depending upon severity of damage, reduced plant growth may be visible for several weeks after application. Research conducted in Minnesota indicated that when corn plants were at the V3 growth stage (three leaf collars visible), phytotoxic effects were worse at rates greater than 60 lb N/acre (rates applied were 0, 60, 90, and 120 lb N/acre), but damage was not permanent and did not adversely affect stand or yield. When plants were larger than the V3 stage, plant damage was worse and some yield depression occurred with the 120 lb N/acre rate. Many herbicides are applied using UAN as the carrier to minimize trips across fields. However, this strategy is only recommended prior to crop emergence. Almost all herbicides prohibit application in N solutions after corn has emerged. Check herbicide labels closely.

If N is to be sidedress applied, then rates can be adjusted from results of the late spring soil nitrate test (LSNT). Soil samples, 0-12 inch depth, are collected when corn is 6-12 inches tall with rate adjustment based on the measured nitrate-N concentration. See ISU Extension and Outreach publication CROP 3140, Use of the Late-Spring Soil Nitrate Test in Iowa Corn Production.

Summary

- There are multiple opportunities to accomplish springtime corn N fertilization.
- If you decide to change N applications, make certain needed fertilizer products and sidedress or high-clearance equipment will be available; or if hiring applications, the dealer or custom applicator can accomplish the applications.
- Consider the N volatilization potential of different materials when applying without incorporation or injection into the soil.
- Successful communication between farmer and dealer is key.

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