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Apply Nitrogen or Plant Corn?

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Apply Nitrogen or Plant Corn?

Abstract

The end of the optimal time for corn planting is quickly approaching. Getting corn planted should be a priority over making nitrogen (N) fertilizer applications. However, along with that decision there should be a plan to get N applications completed after planting and crop emergence. Switching products and application from preplant to sidedress requires availability of needed fertilizers and equipment. So have a plan in place.

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Apply Nitrogen or Plant Corn?

By John Sawyer, Department of Agronomy

The end of the optimal time for corn planting is quickly approaching. Getting corn planted should be a priority over making nitrogen (N) fertilizer applications. However, along with that decision there should be a plan to get N applications completed after planting and crop emergence. Switching products and application from preplant to sidedress requires availability of needed fertilizers and equipment. So have a plan in place.

Apply fertilizers if it does not delay planting

If planned fertilizer applications can be made without a delay in planting, then go ahead and make the applications. For materials such as urea or UAN solution (urea-ammonium nitrate 28 percent or 32 percent solution), those can be broadcast and incorporated with normal tillage before planting. This will work if applicators can stay ahead of tillage operations. Incorporate both of these fertilizers rather than leave them on the soil surface to avoid volatile N loss from the urea. If time is critical and application is to be made with pre-emerge herbicides, then surface application is an option, although more risky due to potential volatile loss and the applied N remaining on the soil surface (especially in no-till) if there is not sufficient rain to move it into the root zone. A rain (at least 0.25 to 0.50 inch within approximately two days after application) will eliminate volatile loss concern. Or, use a urease inhibitor to slow urea conversion, which provides more time for rainfall to move urea into the soil.

Anhydrous ammonia before planting

Anhydrous ammonia has some additional considerations. It must be injected, and the ammonia band will initially have high pH and considerable free ammonia, which can burn corn seedlings and roots. There is no exact "safe" waiting period before planting, and injury can happen even if planting is delayed for a considerable time period. The risk of ammonia injury depends on many factors, with several that are not controllable. For example, risk increases if application is made when soils are wet and then dry (ammonia moving up the injection track); 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 (larger ammonia band). At the current time with the wet soils, the first risk is more likely and it is not uncommon for damage to be found later in the spring. A few things can reduce the risk of ammonia damage: wait and apply when soil conditions are good; have a deep injection depth (seven or more inches); wait several days until planting; if the injection placement relative to future corn rows can't be controlled, apply at an angle; if the injection placement can be controlled with GPS guidance positioning technology, split future corn rows – with this system no waiting period is needed.

Options for sidedress N

If decisions are made to plant corn and then apply N sidedress, be certain to check that needed fertilizer products and application equipment will be available. Best options for sidedressing, in order from most to least preferable, include:

1. injected anhydrous ammonia, UAN or urea,
2. broadcast dry ammonium nitrate, ammonium sulfate or urease treated urea,
3. surface dribbling UAN solution between rows,
4. broadcast UAN, and
5. broadcast urea.

Sidedress injection can begin immediately after planting if corn rows are visible or GPS guidance positioning equipment is used. Be careful so that soil moved during injection does not cover seeded rows or small corn plants. It is easiest to inject in the row middle and there is no advantage in attempting to place the band close to the row. Corn roots will reach the row middle at a small growth stage. Injected N can also be applied between every other row. That technique will provide equivalent response as when placed between every row. For many soils, when planting corn after soybean there should be adequate N in the root zone to meet the needs of small corn plants. For corn after corn, there is a greater chance that additional N is needed for early growth. Preplant or starter N can help meet that need, and is especially important if sidedressing is delayed significantly in either rotation.

Broadcasting urea or ammonium sulfate across growing corn might cause some leaf spotting or edge browning where fertilizer granules fall into the corn whorl. The chances of this happening increases with larger corn. As long as the fertilizer distribution is good and not concentrated over plants, the leaf damage should only be cosmetic.

Because UAN solution is comprised of one-half urea and one-half ammonium nitrate, it has less volatile loss concern than dry urea. A urease inhibitor with surface applied and non-incorporated urea and UAN will help reduce volatile loss. Rainfall will eliminate volatile loss and is needed to move surface applied N into the root zone.

Broadcast application of UAN solution across growing corn has the potential to cause leaf burn and reduced early growth. Depending upon the 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 (vegetative leaf stage defined according to the uppermost leaf whose leaf collar is visible – in this case three leaf collars visible), phytotoxic effects were worse at rates above 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 pre-emergence 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 going 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. Using the LSNT could be especially helpful this spring when there is question about N supply in manured fields. The large rainfall this spring has moved carryover nitrate deeper in the soil profile. A concern with the LSNT this spring is that it will miss that nitrate and therefore over-estimate needed application.

Late sidedress N considerations

If corn becomes too tall for normal sidedressing equipment, it is possible to use high clearance equipment to apply N. The N source typically will be UAN solution, with equipment available to either dribble the solution onto the soil surface with drop tubes or shallow inject with coulter-shank bars (coulter-disk injected) or dry urea, which can be broadcast spread across the top of corn.

Research in Iowa has shown corn can respond to mid- to late-vegetative growth stage N application when there is deficient N supply, but there can be loss in yield potential. Reduced yield occurs more frequently when soils are dry at and after application (applied N not getting into the root zone) and with severe N stress. Best responses occur with sufficient rainfall shortly after application to move N into the active root zone.

If attempts to get N applied preplant or early sidedress have failed, or there are concerns about N supply from prior fertilizer or manure applications, then mid- to late-vegetative-stage application can be a helpful rescue. If possible, have some non-N limiting (approximately 50 percent more than normal rate) reference strips or areas in the field to use for comparison. These areas can be used to visually determine if corn would respond to additional N, or as a check to see if earlier N applications or carryover N is not sufficient. These reference areas are also needed for N stress sensing tools (such as chlorophyll meters or canopy sensors) to help guide application rates. These reference areas should be planned and N applied early in the season, or be field areas that are known to be non-N deficient. Plant and canopy sensing can begin when corn is at approximately the V9-V10 growth stage. If late N application is needed, it should be applied as quickly as possible and not later than the tassel stage.

In summary

- Plant corn when conditions are fit, don't rush.
- Fertilize first if it does not delay corn planting.
- In other situations, sidedress N.
- Make certain needed N fertilizer products will be available.
- Make certain sidedress equipment will be available.

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