It's a Late Spring: Should You Apply Nitrogen or Plant Corn?

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Planting corn

Many areas of Iowa have wet soils and corn planting continues to be delayed. At the end of the first week in May last year we had more that 50 percent of the crop planted. Although the new report is not yet released at the time of this writing, we expect considerably less progress than that.

Our best information from planting date experiments show that corn yields are reduced as we plant into the second half of May. However, looking at planting progress and corn yields over the years, we see that although yields are increasing and in general we are planting earlier every year, above average yields can occur with delayed planting and below average yields can occur with early planting (see Sidebar article 'Corn Planting Progress' from Wisconsin). We don't want to rush planting. But, on the other hand, we don't want to needlessly delay it either by applying fertilizer on days suitable for planting if there are other alternatives for fertilizer application.

For those who have not yet applied nitrogen (N) fertilizer, is it better to apply the N or spend time in the field planting corn when soils dry? Several items need to be considered.

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 solution), those can be broadcast by the dealer and incorporated with normal tillage before planting. This will work if the dealer can stay ahead of the tillage operations. Incorporate both of these N fertilizers rather than leave them on the soil surface due to potential volatile N loss. If time is critical and application is to be made with preemerge herbicides, then surface application is an option, although more risky due to potential volatile loss and the applied N remaining on the soil surface if there is not sufficient rain to move it into the root zone. A rain (at least 0.25 to 0.50 inch within two to three days after application) will reduce the volatile loss concern.

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. This happens because 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, even several days after application); with higher N 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).

This year, with the wet soils, the first risk is more likely and it is not uncommon for damage to be found later in the spring in those situations. 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); if you can't control the injection placement relative to future corn rows, apply at an angle; wait several days until planting; if you can control the injection placement with GPS guidance positioning technology, such as swathing and auto-steer, then split future corn rows – with this system no waiting period is needed.

Options for sidedress N

If you decide to plant corn and then apply N sidedress, be certain to check with your dealer so you can get the fertilizer product you need and application equipment is available. Best options for sidedressing, in order from most to least preferable include: injected anhydrous ammonia, UAN or urea; broadcast dry ammonium nitrate or ammonium sulfate; surface dribbling UAN solution between rows; broadcast UAN; and broadcast urea.

Since UAN solution is comprised of one-half urea and one-half ammonium nitrate, it has less volatile loss concern that urea. You can also use a urease inhibitor with surface applied and non-incorporated urea and UAN to help reduce volatile loss. Rainfall after application will eliminate volatile loss and is needed to move surface applied N into the root zone. Sidedress injection can begin immediately after planting if you can see the corn rows or have GPS guidance positioning equipment. 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.

Broadcast application of UAN solution across growing corn has the potential to cause leaf burn, loss of leaves, 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 are 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 preemergence 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 the corn has emerged. Check herbicide labels closely.

Broadcasting urea or ammonium sulfate across growing corn might cause some leaf spotting 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.

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. Samples should be analyzed by a soil test lab, with rate adjustment based on the measured concentration. Using the LSNT could be especially helpful this year in fields where there is concern about N supply in manured fields.

Late sidedress N considerations

If corn becomes too tall for normal sidedressing equipment, it is possible to use high clearance equipment to apply N. Typically the N source will be UAN solution, and the equipment available can either dribble the solution onto the soil surface with drop tubes or shallow inject with coulter-shank bars (coulter-disk injected). This late application should be considered a last resort or rescue system, and not a planned application especially if there was no N or a very limited rate of N applied before or at planting.

Research in Iowa has shown corn can respond to mid- to late-vegetative growth N application, but often some yield potential is lost. This occurs more frequently when soils are dry at and after application (applied N not getting into the root zone) and when only a low N rate was applied preplant or early sidedress. Best responses occur with sufficient rainfall shortly after application to move N into the active root zone and the corn is not severely N deficient.

If all prior attempts to get N applied has failed, or there are concerns about N supply from prior fertilizer or manure applications, then this mid- to late-vegetative stage application can be a helpful rescue. In addition, if there are non-N limiting reference areas in the field to use for comparison, then N stress sensing tools can be used to help guide the application rate. The adequately fertilized reference areas need to be planned and N applied earlier in the season, before or shortly after planting, or be areas in the field that you know are not N deficient or N stressed. Sensing can begin when corn is at the V10 growth stage. If this timing of application is needed, the N should be applied as quickly as possible, and not later than the tassel stage. In most cases, the amount of N to apply should be limited to a maximum of approximately 100 to 125 lb N/acre.

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 you can obtain the N fertilizer product you need.
- Make certain you have access to sidedress equipment.