Does corn need additional nitrogen?

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Prolonged wet soil conditions in parts of Kansas have resulted in large areas of some fields of corn turning (or remaining) yellow this spring – even up to the V8 stage or beyond. If the yellow color is due to nitrogen (N) deficiency, sidedressing will be needed.

This raises several questions. How much N will be needed? Should the N rate at sidedressing depend on the growth stage of corn? If urea-based products are applied, will it volatilize under current conditions?

The first question regarding rates is perhaps the most difficult to answer. This topic was discussed in some detail in Agronomy eUpdate No. 513, May 29, 2015: https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=584
Much of that article discusses the use of a chlorophyll meter or optical crop sensor, along with a reference strip for comparison purposes, since soil tests are of limited value for sidedressing purposes. If these practices are not available, producers will have to rely on other methods to estimate sidedressing N rates needed.

Supplemental N needs for individual fields may range from 0 to 100 lbs N/acre, but will vary greatly depending on soil texture, drainage, N source applied and when applied. The keys are what loss mechanisms were involved -- leaching on sands or denitrification on heavier soils -- and how much of the fertilizer applied had been converted to nitrate. Urea

and UAN fertilizers convert more rapidly to nitrate under most conditions than ammonia, thus are more rapidly lost. A well-drained silt loam soil which had ammonia applied a week or two prior to planting will likely have much less loss than a similar soil with urea broadcast applied in February or March.

The need for additional N also depends on what the remaining yield potential is. Yield potential has been reduced in many fields by the early-season N deficiency/stunting, especially on early planted corn. Delayed planting has reduced yield potential in other areas. In both situations, N requirements will also be reduced. Potential yield loss is difficult to estimate, but a good starting point might be about one bushel/acre for each day the crop development is delayed by stunting or delayed planting.

If additional N is to be applied, it needs to be applied as soon as possible. Also keep in mind that rainfall will be needed to move surface-applied N into the root zone. But keep in mind also, that there is likely a significant amount of N remaining in most fields, which will carry the plant for a while, which is why many fields are greening up as the soil dries and oxygen returns to the root zone. Much of the N applied now will be to avoid N stress later in the season as the current depleted preplant supplies run out.

It is difficult to say exactly how much, if any, additional N needs to be applied. If additional N is going to be applied, our estimate would be that amounts will vary from 30 to 80 lbs N/acre for many situations this year, with lower amounts on productive, well-drained silt loams which received spring, preplant ammonia. Higher N losses will have occurred on poorly drained soils, such as clay pan soils, or on sands or sandy loams prone to leaching, and higher sidedress N rates will be needed in many of those situations. Fields that received broadcast urea in late winter/early spring will also likely need larger amounts of supplemental N.

There are a number of ways to apply nitrogen after corn planting:

- Ammonia can be sidedressed, beginning as soon as the rows are up and visible, and the ground is in good enough condition that the application won't damage seedling corn with slabs of soil. Normally ammonia can still be applied with minimal stalk breakage or root pruning damage until the 6-7 leaf stage of corn, approximately 30-35 days after emergence.
- UAN solutions, either 28% or 32%, can be applied as a surface band after emergence. UAN can also be coulter-banded as a sidedress with ground equipment until the 6-7 leaf stage. If that's not possible or desirable, UAN can be applied with high clearance sprayers and drop hoses to the soil surface as a sidedress typically as late as the 16- to17-leaf stage. However, new research shows that current corn hybrids can response to N application as late as silking stage if N deficiencies are observed. This can provide a good window for N application if high-clearance equipment is available. It's important to avoid applying UAN over-the-top directly on the plant and damaging leaf tissue, especially at the 5- to 6-leaf stage and later, when the tassel is developing and when the number of rows of kernels on the ear are being determined. Research has shown that burning a leaf or two at the 2- to 4-leaf stage will have minimal effects on yield.
- Urea can also be broadcast after planting as late as the 5- or 6-leaf stage with minimal damage to plants and good response. In a rescue situation, urea has been successfully

broadcast over the top of 10- to 12-leaf corn, or aerially applied even later. Some leaf speckling or flecking will be seen, but good responses can still be obtained. With surface application of urea-containing fertilizers, the risk of volatilization losses increases with warm temperatures. The application of urease inhibitor products can help to reduce N losses, particularly if no rainfall is forecasted for the next 7-10 days.

A final comment: Make sure that the cause of the stunting and off color corn is N deficiency. Odds are that if the corn has turned yellow mostly in the lower lying areas of the fields and the fields have been saturated or extremely wet, it is N deficiency due to denitrification or leaching – or simply the inability to make planned applications of N. But there are other causes of yellowing to consider.

There have also been cases in eastern Kansas in recent years where yellowing in corn is due to potassium deficiency, especially in reduced and no-till systems. Nitrogen deficiency symptoms are exhibited on the lower leaves first, with the leaves yellowing from the leaf tips back down the mid-rib in an inverted ‘V’ pattern.

Potassium deficiency also develops on the lower, older leaves first, but causes the leaf tips and margins to “fire” and die. Both N and K deficiency often do not occur uniformly across the whole field, but in an irregular pattern.

Other possible causes of yellowing may be sulfur or zinc deficiency. With sulfur deficiency, first the upper leaves then the entire plant turns a pale yellow. However, an overall plant chlorosis can also happen when the corn roots are too wet and deprived of oxygen. In that case, the overall yellowing will mask any true nutrient deficiencies until the soil begins to dry out and roots are able to resume growth.