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Dealing with cool and wet conditions

April has been a little warmer and drier than average so far this year, which has allowed a good start to corn planting and some progress in soybean planting. This is expected to change, with above-normal rainfall and below-normal temperatures over the next 10 days or so, through the first week of May.

It rained on Easter Sunday most places in Illinois, which according to the old saying means that it should rain on each of the seven Sundays after Easter. It did not rain in most places the first Sunday after Easter (April 23), so that prophecy won't be fulfilled this year. That hardly means it can't turn wet.

Above-normal growing degree day accumulations have meant fast emergence for corn. In central and southern Illinois, corn planted by April 19 accumulated, by April 25 or 26, the 115 or so GDD required to emerge. With lower temperatures expected over the next ten days, corn planted on April 25 or 26 may take almost twice as many days to emerge as corn planted in mid-April.

The drop in temperature along with rain on April 26 (and more to come) has some people concerned about the "imbibitional chilling injury" that can accompany such conditions. This can happen when the water available to the corn seed has a temperature in the lower 40s or less. Uptake of cold water damages membranes, and this in turn may cause abnormal seedling development and failure to emerge.

If the corn seed can take up some warmer water before soil (and water) temperatures drop, we often see less injury or none at all. So corn planted early this week should be out of danger. Corn planted on April 25 or 26 may be at risk, but rain that fell on April 26 was not very cold, and with air temperatures expected to rebound into the 70s the last two days of April, along with the (warmer) rain that's predicted, we hope not to see much of this problem from this round of weather.

A larger concern is how seeds and seedlings might be affected by the rainfall expected over the next few days, followed by the slow rise in temperature that is predicted. Seeds that are starting to germinate need oxygen, and will usually not survive the low oxygen levels in saturated soils for more than a couple of days. They will survive longer if soil temperatures are cool, both because that slows growth and lowers oxygen demand, and also because cool water carries more oxygen into the soil. If soils start to dry off early next week, survival will be a concern mostly where water stands.

Young seedlings have the advantage of having roots that might find pockets with more oxygen, but they still depend on seed reserves to grow, especially if it's cool and cloudy, and before leaves have much green area. These reserves are mostly used up by the time the plant has two leaves, and diseases can invade the endosperm, especially in cool, wet soils. So we can expect seedlings to live for maybe three or four days if they are submerged, and a few days longer than that if only the roots are in saturated soil. If plants remain alive, chances for seedlings to revive and thrive increase considerably once oxygen gets to the roots again.

Soybean issues are not unlike those with corn, although soybeans die in saturated soils a little more quickly than corn, and fewer soybean fields have emerged. Cooler soils will help seeds survive longer, but diseases like *Pythium* often thrive on cool, wet soils. The need to replant soybean fields can be assessed after emergence of the first seedlings in a field, by checking to see if seeds that haven't emerged are still alive. Presence or absence of a healthy radicle (emerging root) is the easy test to see if a seed is alive.

Nitrogen

In plots where we applied 200 lb. N as anhydrous ammonia last fall, samples taken in mid-April this spring had about 230 lb. N per acre in the top 2 feet of soil. That's 25-30 lb. more N than we recovered in mid-November last fall. Where we applied no fertilizer N, we recovered 56 lb. N per acre last fall and 90 lb. N this spring. So the amount of N from fertilizer changed hardly at all over the past five months, and (net) mineralization added some N. We recovered about 30 lb. more N last fall and 26 lb. more this spring where we had used N-Serve®. Because the

amounts were different last fall before N loss could have occurred, we can't be sure if this difference is due to use of the inhibitor.

With the mostly dry conditions we have had over the winter and early spring, finding little or no loss of N, while a relief, was not unexpected. In the November samples, 70% of the N was in the ammonium form, safe from movement out of the soil and from denitrification. In April, however, only 25% of the recovered N was in the ammonium form. These percentages were the same whether or not we had used N-Serve®. The 75% of the soil N that is now nitrate can move deeper into the soil – including into tile lines – as water moves. It can also denitrify, releasing the N back into the air, under saturated soil conditions.

It would be premature to predict the loss of fall-applied N at this point. If rains come too fast for soils to take in the water, the resulting runoff will be a real problem for erosion and for forming ponds in lower-lying parts of fields. But runoff water normally carries little N off the fields if the N is not on the soil surface. In most tile-drained fields, which typically have heavier soil textures, water movement down is not very fast, and if conditions turn drier next week, water carrying nitrate will move back up as the water at the soil surface evaporates. Denitrification will start after a few days in standing water; it takes time for the oxygen to be depleted. The rate of denitrification will be fairly slow, however, until soil temperatures, which now range from the mid-50s to the lower 60s, get somewhat warmer. Having soils dry in the meantime will allow oxygen back in, which will stop denitrification.

While we know that corn plants benefit from having N in the soil when and where their roots emerge and start to grow, a return to soil conditions that encourage plant growth will also mean a resumption of mineralization, which will help provide N to the plants. Any ammonia or urea-based fertilizer N that was applied this spring should still be mostly in the ammonium form, which should remain in the soil after any heavy rains that may come in the next week.

While we will keep looking to see how well N is remaining in the soil, there is no need to try to replace N before we can tell it's missing. The priority instead is on emergence and health of the crop, and that mostly depends on the weather over the coming weeks. Having cool temperatures linger is probably a bigger concern than heavy rain at this point, except where ponds might form long enough to that kill the plants.

The other concern, of course, is getting the rest of the crops planted. If the weather remains cool, emergence and growth will be quite slow even if it does eventually dry up enough to resume planting. So warmer temperatures will help both to dry things out and to get the planted crop growing. If it helps, you might remember that we had almost no corn planted in Illinois by this time in 2014, and we harvested our highest yield ever.

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