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ASSESSING NITROGEN LOSSES

Heavy spring rains have raised questions about nitrogen fertilizer losses. Water saturated fields may result in leaching and/or denitrification nitrogen losses. Potential nutrient losses will depend on how much rainfall occurred; field soil textures; amounts of nitrogen applied; total soil water storage available; and water and soil temperatures.

Denitrification may occur in saturated soils. Usually, after two days of standing water in fields, the absence of oxygen (anaerobic conditions) allows bacteria to increase and transform soil nitrate into gaseous nitrogen resulting in losses to the atmosphere. This process may be triggered by excess water replacing oxygen molecules in the presence of carbon (soil organic matter). Loss rates then depend on temperatures and duration of water standing on fields.

Just because water is ponding does not automatically mean that the denitrification process is happening. Under low temperatures, nitrogen losses are estimated at 3 to 4 percent of nitrate-nitrogen for each day after the first two days of saturation. Dr. Charles Shapiro, Nebraska Extension Soils specialist, says that when soil temperatures reach 55 -60 degrees F° with ponded soils, 10% of applied nitrogen may be lost at 5 days and 25% lost after 10 days of ponding. University of Nebraska soil nitrogen field loss studies show, when temperatures increase to 75-80 degrees F° with water ponding, the denitrification nitrogen rates were 60%, 75%, 85% and 95% at 3, 5, 7 and 9 days of standing water respectively. The good news is these recent flooding storms came and went quickly.

Nitrate leaching may also be a potential problem with excess rainfall. Nitrogen in the ammonium form applied just before the rains may not have moved as far as versus if the nitrogen was fall-applied. Infiltrating water will dilute nitrate slowly as it moves down the soil profile. In these cases the nitrogen may not be lost, but plant roots may need time to grow down deep enough to reach the enriched nitrogen zones. Our silty clay loam soils take in water slowly. The amount of water soaking in soils was not a lot during these heavy showers.

So, nitrogen losses are a concern, what should be done? I think that since losses are likely to be minor in most fields that producers could test rather than apply more. Use pre-sidedress nitrate-N (PSNT) tests for 0-1 and 1-2 foot soil depths. If the nitrate-N level is less than 11 ppm, there is a good chance corn will respond to a sidedress application of nitrogen ranging from 100 to 150 lbs nitrogen (N) per acre. For fields with 11 to 25 ppm nitrate-N, corn may or may not respond to sidedress nitrogen. Recommended rates at this test level may be up to 100 lbs. N per acre. Lower rates would be used as nitrate-N approaches 25 ppm. When soil test nitrate-N is greater than 25 ppm, plant-available nitrogen should be adequate; and corn will probably not respond to sidedress N application.

Consider using crop canopy sensors or MaizeN software to sidedress extra nitrogen and replenish lost nitrogen. Brian Krienke, Nebraska Extension Soils Educator, recommends the free UNL Nitrogen Loss Assessment tool: N-LAT which uses Excel to estimate average nitrogen losses and determine best nitrogen strategies.

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