

INTEGRATED CROP MANAGEMENT

Nitrogen losses after the heavy rains

The recent heavy rains have raised questions about nitrogen (N) losses. In wet field areas it is common to find off-color corn, but that does not necessarily equate to N shortage. So be careful as you initially are seeing plant response to wet conditions (slowed root activity and growth). The amount of N taken up by corn to the V6 stage is small (about 20 pounds N per acre, so pale-yellow color is now due to wet conditions). Before a decision is made to apply supplemental N, you should consider the potential productivity remaining after soils have dried. Has the stand been damaged, will the plants recover fully, will the area be replanted, and is the yield potential reduced because of conditions other than N loss? It is possible that the combination of inorganic N remaining in the soil, plus N mineralized during the rest of the growing season, can supply adequate N.

Factors affecting nitrogen losses

Nitrogen is lost from soils as nitrate-N with leaching (water movement through soil) and denitrification (biological conversion to N gases with saturated soil). It is the conversion of soil N and applied N (fertilizer and manure) to nitrate, and subsequent excessively wet, warm soils, that enhance the potential for N losses. Nitrogen in organic or ammonium forms will not be subject to loss. Use of fertilizer products containing more ammonium, use of a nitrification inhibitor, and application closer to a period of wet conditions result in less loss.

Deciding whether losses are substantial enough to warrant supplemental application is not easy and should include consideration of several factors: 1) amount of nitrate present when wet conditions occur, which is affected by time of N application, form of N applied, rate applied, and use of a nitrification inhibitor; 2) when during crop development and the length of time soils are saturated; 3) soil potential for leaching and denitrification; 4) loss of yield potential from water damage; and 5) rate of N applied. Furthermore, water movement into soil, leaching, runoff and ponding are not uniform across the landscape with heavy rains; thus, the potential for N loss can be variable.

According to estimates of denitrification rates from the University of Nebraska, when soil temperature is 55 to 60°F, N loss is 10 percent when soil is saturated for five days, and 25 percent when saturated for 10 days (1-2 percent per day). Loss accelerates with warmer soils. Research conducted at the University of Illinois (late May to early June excess application of water on silt loam and clay loam soils; soils warmer than 65-70°F) indicates approximately four to five percent loss of nitrate-N present per day that soils are saturated. Losses by leaching are rapid on sandy soils.

Applying additional nitrogen

In the Illinois research mentioned above, after keeping silt loam and clay loam soils saturated for three to eight days, applying an additional 50 pounds N per acre was sufficient to increase corn yields to approximately the same level where no excess water was applied. In field situations with manure or full N rates, a suggestion is to limit additional N application to 60-90 pounds N per acre. When conventional application equipment can be moved through the field, then injection of anhydrous ammonia or urea-ammonium nitrate solutions (28 or 32 percent UAN) would top the list of best application options. Next would be broadcast dry ammonium sulfate, dribble banded UAN, and then broadcast urea. Broadcast UAN should be avoided as it will burn corn foliage, especially with large corn. When corn gets tall, then UAN could be applied with high-clearance equipment using drop nozzles that directs the solution onto the ground or coulter-injected, or urea could be flown on.

Refer to articles in the June 18, 2001 [1], July 3, 2000 [2], and June 14, 1999 [3] issues of the ICM newsletter for further information on N loss.

This article originally appeared on pages 61-62 of the IC-492(10) -- June 7, 2004 issue.

Source URL:

<http://www.ipm.iastate.edu/ipm/icm//ipm/icm/2004/6-7-2004/nloss.html>

Links:

[1] <http://www.ipm.iastate.edu/ipm/icm/2001/6-18-2001/soilnitrate.html>

[2] <http://www.ipm.iastate.edu/ipm/icm/2000/7-3-2000/whataboutn.html>

[3] <http://www.ipm.iastate.edu/ipm/icm/1999/6-14-1999/estnloss.html>

IOWA STATE UNIVERSITY
University Extension