GoldenHarvest®

AGRONOMY IN ACTION: Newsletter

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Nitrogen Loss in Corn Fields

Nitrogen is an essential nutrient in the growth and development of corn. Rapid uptake of nitrogen by corn plants begins at V6, with the plant having taken up 75% of the total N need by R1. Corn plants deficient in nitrogen will have a yellow "V" that runs down the midrib of lower leaves to the center of the plant. Since nitrogen is mobile in plants, the symptoms will begin on the lower leaves of the plants. In severe cases, plants will be stunted, pale green to yellow in color, and will cause smaller ears with "tip back" and smaller kernels. Nitrogen deficiency can cause poor stalk quality and late season standability, as the plants remove available nutrients from the plant to fill the ear. Managing nitrogen loss and adding additional nitrogen after a loss has been determined is essential to maximize yield.

Nitrogen deficiency symptoms on corn
Source - Syngenta

Types of Nitrogen Loss:

1. **Runoff** - Movement of nitrogen by water to off target areas. Nitrogen applied to the soil that was not incorporated either through tillage or a gentle rainfall are at risk from loss due to excess rainfall and runoff.

2. **Leaching** – Downward movement of nitrogen by water through soil profile past the rooting depth of the crop. All fertilizer forms of nitrogen are converted to nitrate in warm, moist soils and are susceptible to leaching. With rainfall and/or irrigation, nitrate can move deeper through the soil profile and become unavailable for plant uptake. Leaching is a higher risk in moderate to coarse soils with good internal drainage.

3. **Denitrification** - Gaseous loss of nitrogen due to the conversion of nitrates to nitrous oxide or nitrous. Warm, saturated conditions that persist for more than 48 hours can create an anaerobic environment in the soil. As oxygen is depleted, anaerobic microorganisms will obtain oxygen by removing it from the nitrate, creating the gaseous forms of N, both of which are unavailable to plants. These gaseous forms of nitrogen can volatize from the soil surface. Denitrification is a higher risk in moderate to fine soils with poor drainage or areas of the field which tend to stand water.

4. **Surface volatilization** – soil surface loss when the N source contains urea forms that are not incorporated into the soil. As urea is converted to ammonium, the initial conversion is to ammonia (gas). If this conversion happens prior to incorporation, the ammonia can be lost to the atmosphere.

Determining if additional Nitrogen may be needed in season:

1. Take the soil samples when the corn is 6-12 inches tall.
2. Sample similar areas in field by pulling 10-20 soil cores at a minimum 12” depth. If possible, sampling to a 24” depth for corn is ideal. This can be done by a single 0-24” sample or by two samples (0-12” and 12-24”) for a stratified view of where most of the nitrogen is located. The representative areas should be similar in soil type and drainage, and more cores should be pulled when the area is larger. Several samples may need to be pulled for larger fields with diverse soil types and slopes. Label samples accordingly and make notes on field maps of where the sample areas were pulled to refer back to when the results are obtained.
3. When pulling the soil cores, make sure to avoid known nitrogen bands in the field, such as anhydrous ammonia, strip-till, and starter fertilizer bands. Sample in-between the bands if possible.
4. If the results of the tests show that soil nitrate levels are below 25 ppm, additional N should be added to the field. Iowa State has a formula for determining the additional N needed based on the soil test results. ISU recommend subtracting the soil nitrate from the test from 25, the critical level, and then multiplying the difference by 8, to get the additional N needed. An example would be if the test results showed that a soil had 20 ppm of nitrate in the soil, you would take 25 ppm – 20 ppm = 5 * 8 = 40 # / acre of N needed.

Side-dress Nitrogen Options:

1. Anhydrous Ammonia can be used to side-dress corn, ensure proper closure of the knife tracks to prevent nitrogen loss and leaf burn, however some will still occur on the ends when the toolbar is picked up.
2. Dry urea, or ammonium nitrate, or ammonium sulfate can be applied with a high clearance applicator. Consider treating urea with a urease inhibitor as it can be at high risk for volatilization if not incorporated within the first couple of days. It can be incorporated with overhead irrigation with at least 0.5” of irrigation.
3. UAN can be injected into the soil, dribbled on by sprayer, or applied by fertigation. If it is dribbled on without incorporation, again consider using a urease inhibitor or mixing with ammonium thiosulfate (ATS) as ~25% of the nitrogen in UAN is urea and can be subject to volatilization.

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