

Spring Nitrogen Application for Corn

The Tri-State Fertilizer Guide gives the following recommendations on corn nitrogen application. The timing of nitrogen (N) fertilizer applications is an important factor affecting the efficiency of fertilizer N because of leaching and denitrification. Denitrification occurs when nitrate N (NO_3^-) is present in a soil and not enough oxygen (O_2) is present to supply the needs of the bacteria and microorganisms in the soil. If oxygen levels are low, microorganisms strip the oxygen from the nitrate, producing N gas (N_2) or nitrous oxide (N_2O), which volatilizes from the soil. Three conditions that create an environment that promotes denitrification are wet soils, compaction and warm temperatures. Timing N applications to reduce the chance of N losses through these processes may increase the efficiency of fertilizer N use.

Ideally, N applications should coincide with the N needs of the crop. This approach requires application of most of the N requirement for corn during a period 6 to 10 weeks after planting. The efficacy of time of application depends on soil texture, drainage characteristics of the soil, amount and frequency of rainfall or irrigation, soil temperature and, in some situations, the fertilizer N source. Nitrogen timing options usually include fall applications, spring preplant applications, sidedress or delayed applications made after planting, and split or multiple treatments.

Fall N applications are usually less effective than spring applications. In general, fall-applied N is 10 to 15 percent less effective than N applied in the spring. Higher N application rates should not be used in the fall to try to make up for potential N losses. Use of a nitrification inhibitor with fall-applied N can improve the effectiveness of these treatments. Most studies show, however, that spring-applied N is more effective than inhibitor-treated fall N when conditions favoring N loss from fall applications develop. Inhibitor-treated anhydrous ammonia was superior to anhydrous ammonia when applied in the fall, but not when applied in the spring. Spring-applied anhydrous ammonia, however, was on the average better than the fall inhibitor-treated ammonia. To increase the effectiveness of fall-applied N with an inhibitor, delay the application until soil temperatures are below 50 degrees F.

Benefits from delayed or sidedress N applications are most likely where there is a high risk of N loss between planting and crop N use. Preplant N losses occur from sandy soils through leaching and from poorly drained soils through denitrification. For medium- and fine-textured soils, yields seldom differ between preplant and sidedress application. Occasionally, sidedress application can be superior to preplant application when early season rainfall is excessive. The advantage to delaying N application is to assess crop needs based on soil moisture and crop conditions. The disadvantages of delaying the major fertilizer N application are: the crop may have been under N deficiency stress before fertilizer N is applied, resulting in a yield loss; wet conditions during the sidedress application period can prevent application, and later additions may not be possible because of corn growth; and dry conditions at and after sidedressing will limit N uptake (Tri-state Fertilizer Guide, pg 5-10).

John Sawyer, Iowa State University Extension Soil Fertility specialist says, “In a wet spring or a wet early summer, sidedressed N should perform better than N applied preplant, because there is typically less N-loss associated with sidedressing,” he says. “In contrast, preplant N applications typically work better when conditions are dryer-than-normal during spring and early summer or equally as well with sidedress when conditions are normal.”

“Sidedressing is typically better for poorly drained soils or sandy, or excessively drained soils, where there’s more risk of N loss,” Sawyer says. “For moderate to well-drained, fine-textured soils, that don’t tend to pond, the N-loss risk is lower, and preplant N applications can perform equal to or better than sidedressed applications.” (Taken from Corn and Soybean Digest, 2010.).

Sebastian Braum, a Yara North America agronomist says farmers who are able to sidedress 32% urea-ammonium nitrate (UAN) solution will likely garner the best value for their dollar. “Sidedressing 32% UAN is a good hedge against N loss, especially if you anticipate a cool, wet spring,” he says. “Good managers know that they’ll get the best performance out of their N dollars if they split-apply. So, I would recommend putting half your N down pre-plant as close to planting as possible and half your N down after planting. If you sidedress anhydrous ammonia, stay within the rows or you’ll burn the roots and it takes longer for the N to become available to the corn than 32% UAN, which becomes available to the crop immediately,” (Taken from Corn and Soybean Digest, 2010.)