Best Practices for Effective In-Crop Nitrogen Applications

Right source, right rate, right time, right place. The Fertilizer Institute’s 4R nutrient stewardship program recommends corn farmers split up nitrogen (N) applications into multiple treatments to limit nutrient loss as well as to support greater nutrient efficiency and yields. The goal is for the N to end up in the right place at the right time for the crop to use it.

Best Time

Growers must balance a crop’s N needs with the weather and their personal availability to make the most timely applications. While fall N applications risk the most nutrient loss to the environment compared to pre-plant or side-dress applications, loss can also occur during the spring if soils are wet when the crop is coming up, says University of Missouri Extension specialists.

Iowa State University Extension reports maximum nitrogen uptake occurs when the corn begins to grow most quickly, which happens during stages V9 through V18. Application prior to stage V9 is best.

In fact, Iowa State’s data show injecting UAN in a side-dress at the V4 through V6 stages may be one of the most effective methods for delivering nitrogen so the corn is ready to take up greater amounts after V8. Farmers may want to consider side-dress injection immediately after planting if corn rows are visible or GPS guidance is used. The university’s research finds injecting UAN in the row middle may be the ideal spot so corn roots from either side can reach it easily.

If the early window for application is missed, North Dakota State University says the four-leaf stage may be the second most desirable application timing. Using UAN with a coulter to get the nitrogen into the soil at about 2” deep provides beneficial results.

This graph shows the timing and percentage of nitrogen used by corn at its various production stages.
Best Source

Different sources of nitrogen, including granular, liquid and anhydrous, all have their places in the fertilizer realm, as long as they are applied at the right place and at the best rate.

Anhydrous ammonia, for example, should be injected into the soil to protect from loss, according to The Fertilizer Institute, while urea spread over the top for a second in-season application is vulnerable to surface volatilization. Preferably, urea-containing fertilizers should be injected, or at least applied when rainfall or irrigation water may incorporate the product, or it should be incorporated by a tillage pass.

Iowa State University Extension advises that if decisions are made to plant corn and then apply N side-dress, the best options in order of effectiveness are: injected anhydrous ammonia, UAN or urea; broadcast dry ammonium nitrate, ammonium sulfate or urease-treated urea; surface dribbling UAN between rows, broadcast UAN or broadcast urea.

Best Place

The same nitrogen sources used for pre-plant are generally compatible with side-dress application, reports Pennsylvania State University research, noting UAN is one of the most versatile, especially with no-till corn. UAN solution can be applied either through drop tubes that dribble fertilizer onto the soil surface or shallow injected with coulter-shank bars. University of Missouri researchers recommend injection because it prevents tying up UAN solution on crop residue.

Surface applying nitrogen before corn has canopied is not ideal. University of Montana research shows if nitrogen is applied without being injected into the ground, covered or watered in, it can be lost to volatilization. Injecting N with a coulter-mounted knife, or high-pressure injection behind a coulter when applying before canopy, is a preferred way to effectively apply nitrogen.

Nitrogen Cycle

References

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