AGRONOMIC Spotlight
Technology Development by MONSANTO

Spring Fertilizer and High Residue

High amounts of corn residue in the spring may create some challenges related to nitrogen (N) management. Corn residue is generally an asset, because it lowers the risk of erosion and returns carbon and nutrients to the soil. Increased residue on the surface and within the soil, however, creates a soil environment that is wetter, cooler, and less aerated compared to other environments. The proper timing and placement of fertilizers in this unique soil environment is critical to minimizing nitrogen (N) loss and protecting yield potential.

Several components of a fertility program can be adapted to high residue environments. Corn growers generally have three options for applying the majority of their N: preplant injection, surface applications of urea-based compounds, and sidedressed injection. Starter fertilizer may also improve nutrient availability in cool, wet, high residue soils. All fertilizer application methods have their own advantages and potential disadvantages.

Pre-plant Anhydrous Ammonia (NH_3)

Application of pre-plant anhydrous is an option as long as it does not delay corn planting. This form of N may injure seedlings, and adequate time should pass between the application and planting. While one week is normally sufficient, more time may be needed if a high rate was applied, the application occurred on wet or heavy clay soils, or in dry, coarse textured soils. Deep applications (7-inches or more) and applications at an angle to the row are recommended to avoid seedling injury. The assistance of RTK-GPS (real time kinematic GPS) to place bands away from future corn rows can minimize down time and help to avoid this type of injury.

Anhydrous should not be applied to heavy-textured soils (clay loams, silty clays or clays) when they are wet. It is difficult to get a good seal behind the application knives, and ammonia may escape. Further, the running of application equipment over wet, heavy-textured soils may destroy soil structure and lead to compaction. Nitrification inhibitors (NI) have beneficial effects on reducing N loss from nitrate leaching and nitrous oxide emissions in anhydrous applications, and as a result, may lead to greater N use efficiency and improved plant health.

Other Pre-plant Options

Pre-plant N can also be applied in liquid and dry forms. Various urea-ammonium nitrate-water (or UAN) mixtures are classified as “non-pressure” nitrogen materials, and commonly make up the feed portion of a weed-and-feed program. Liquid and dry products that contain urea should be incorporated by rain or tillage soon after application or applied with a urease inhibitor to prevent losses due to volatility.

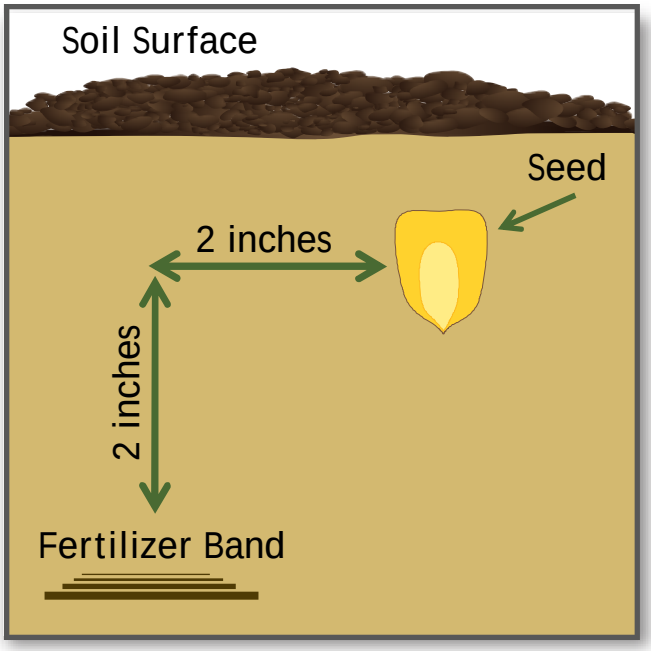

Figure 1. The most common placement of starter fertilizer is 2 inches below and 2 inches to the side of the seed row.

Nitrogen is immediately available for plant update when liquid and dry fertilizers are applied. This form of N can also be combined with a herbicide application, has less risks for seed or seedling injury and soil compaction compared to spring ammonia, and it can be applied with other nutrients (N, P, K, S, etc.). However, this form of N costs more per unit compared to ammonia, and requires incorporation by rain or tillage. Incorporation may not be ideal for applications made with an herbicide. Urease inhibitors (UI) block the reaction that converts urea to ammonia, and can be used to prevent volatile loss of urea.

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Starter Fertilizers

Starter fertilizers can help to mitigate the conditions of reduced growth rates, lack of nutrient mobility, and decreased nutrient mineralization that may occur in cool, wet soils. Corn tends to respond well to starter fertilizer, especially in cool soils. The fertilizer meets the early demands of the seedling until the root system develops. Placement of the fertilizer two-inches to the side and two-inches below the seed is recommended.

In warm soils, however, corn may not respond to starter fertilizer as consistently as in cool soils. The application of fertilizers in a 2X2 band requires additional costs to equip planters, and the application process generally slows planting. These drawbacks, plus the availability of low-salt fertilizers, have lead to an interest in seed-placed (pop-up) fertilizers. No more than 10 to 15 lbs per acre of $N+K_2O$ should be applied with the seed because of the risk of salt injury. Urea and DAP are not recommended for seed-placed use because they release ammonia.

In-Season Applications

Applying N after crop emergence or sidedress can be a viable option, especially when pushed for time before planting. In-season N applications have the added benefit of synchronized N availability and crop uptake. Knifing or injecting the N will increase the distance from the residue and may reduce the risk of N immobilization and potential atmospheric loss due to volatilization. Fertilizer products and application equipment should be lined up in advance to allow for timely applications.

If no pre-plant N has been applied, sidedress applications should begin as soon after emergence as possible to help meet the N needs of early corn growth. The use of starter fertilizer or applying a portion of your N pre-plant (split application) will extend the sidedress window later into the season. If rain delays application, yield potential may be reduced depending on corn growth stage and nutrient needs of the plant. The N product (anhydrous, urea, or UAN) could be injected down the middle of the row or every other row, broadcast, or surface dribbled. Some leaf burn is expected after broadcast applications of urea, but it will not reduce crop yield potential.

Summary

The management of N is important because this nutrient is one of the most expensive inputs, and one that can pose environmental concerns. High residue and potentially cool, wet environments create challenges for fertilizer application. Several resources are available to assist you with N applications this spring. No matter the approach, remember that split applications spread risk, improve efficiency, and potentially increase yields.

Sources

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