Fall Anhydrous Ammonia Application

- Anhydrous ammonia is the recommended source of nitrogen for fall applications because the risk of losing nitrogen is relatively less compared to applications of other forms of nitrogen fertilizer.
- Applications should be made when soil temperatures are below 50°F, using a nitrification inhibitor, and when soil conditions are not too wet or too dry.
- Limiting the amount of nitrogen applied in the fall helps to minimize economic and environmental risks.

Applying Nitrogen in the Fall

Applying anhydrous ammonia in the fall before your next corn crop has advantages. Fall application of nitrogen (N) spreads out the workload, allowing more time to focus on planting in the spring, reduces soil compaction in the spring, provides better assurance that N is available if wet conditions in the spring prevent pre-plant application, and potentially can lower fertilizer costs. However, there are disadvantages to fall N application as well. Applying N in the fall can be riskier than preplant or in-season sidedress applications because of the potential for N loss between the time of application and crop use. Environmental concerns of nitrate leaching and runoff into groundwater, ponds and streams also are increased.

Anhydrous Ammonia

The recommended source of N for fall applications is anhydrous ammonia (NH_3) because it converts to nitrate (NO_3^-) in the soil at a slower rate than other N fertilizers. The nitrate form of N is available for plant uptake, but can also be lost through leaching, denitrification, and volatilization. Anhydrous ammonia is a gas that quickly reacts with water in the soil to form ammonium (NH_4^+). Ammonium is not subject to N loss because it is bound to clay and organic matter in the soil. Nitrification is a microbial process in the soil that converts ammonium to nitrate.

The nitrification process is soil temperature dependent and becomes limited when soils reach 50°F. Nitrification continues down to 32°F, but at a slower rate. Denitrification is a microbial process that occurs under anaerobic (lack of oxygen) soil conditions where nitrate is lost when it is converted to N gases (N_2, N_2O, NO) and these gases are lost through volatilization. Warm periods in late winter and early spring allow ammonium to be nitrified to nitrate that can be lost by leaching or by denitrification under wet conditions. It is challenging to determine how risky fall application of N will be. A wet spring will increase the risk of N loss, but if the following spring is dry, there may be little risk of N loss from a fall application.

Nitrogen Stabilizers

Nitrogen additives can be used to help delay N transformations and prolong N availability for fall application. If N stabilizers are used with N fertilizer applications, the amount of N loss may be reduced, even if weather conditions are not ideal. Nitrification inhibitors inhibit soil bacteria responsible for denitrification, slowing the conversion of ammonium to nitrate.

Fall Anhydrous Ammonia Application

Recommendations for Application

- Wait until soil temperatures are below 50°F at the 4-inch depth. Anhydrous ammonia should be applied in late fall after soils cool to 50°F and continued cool weather is in the forecast.
- Use a nitrification inhibitor to help slow the conversion of ammonium to nitrate.
- Soil conditions at application should not be too wet or too dry but should have enough water to allow the ammonia to spread in the soil and convert to ammonium. Moderate soil moisture conditions are best. Ammonia can be lost through volatilization during and after application if the knife injection slots in the soil do not seal properly. Slots can be very difficult to close when soil is wet. In dry soil, volatilization loss can be minimized by increasing the depth of application to 8 inches. If the soil is cloddy, channels may allow the ammonia to move through the soil and escape as gas.
- Avoid application to soils that are prone to wetness or leaching. Sandy soils or those with excessive drainage, high pH, and poorly drained soils should not receive fall N applications.

Minimizing Risks

- Consider a split application of N in the fall and spring. This approach can help reduce the amount of fall-applied N loss if soil conditions become conducive to loss. The fall-applied N can provide what the corn crop needs to get started in the spring. The remainder can be applied closer to when the plant N uptake is the greatest and can increase use efficiency because there is less chance for leaching and denitrification.
- Limit fall N applications to only some of your planned corn acres. This practice can help limit the number of acres at risk and balance the convenience of fall N application with the economic and environmental risks.
- Monitor early season corn growth to assess supplemental N application needs.

This Spotlight is intended only as a summary of key aspects of fall application of anhydrous ammonia on corn. Please consult with your qualified Bayer agronomist to discuss further details.

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