

ANHYDROUS RETENTION IN DRY AND COMPACTED SOILS

Applying nitrogen fertilizer in the fall rather than waiting until spring continues to be a popular practice among corn growers. Usually the cost is lower, there's more time for application, and soil conditions are often better than in the spring. While some growers have switched to applying all or part of their N in spring to reduce risk of loss by applying closer to the time when corn can use it, there is still a lot of N, especially anhydrous ammonia, applied in fall.

John Sawyer, Iowa State University Extension soil fertility and nutrient management specialist, says success with fall fertilizer N application compared to spring or sidedress timing can be enhanced by following these suggestions:

- Only use anhydrous ammonia.
- Apply in late fall after soils cool to 50 degrees F (at 4-inch depth) and are trending cooler.
- Consider using an effective nitrification inhibitor to further slow conversion of the ammonium form of N to the nitrate form.
- Avoid fall application to soils that are more prone to wetness or leaching (poorly or excessively drained soils).

What about dry soils?

Many areas of Kansas have dry soils this fall; fields are dry after the summer drought. Can anhydrous ammonia be applied to dry soils? Will it be held in dry soil? "Yes, dry soil can hold ammonia."

Even air-dried soil contains some moisture although quite low, he explains. Ammonia dissolves readily in water but is held or retained in soil by clay and organic matter. The problem with dry soil and low moisture content is soil moisture is needed to temporarily hold the ammonia so it can become attached to clay or organic matter as ammonium. Soil moisture allows the ammonia to go into solution and become attached to the soil.

If dry soils are cloddy and don't seal properly, ammonia can be lost at injection, or seep through the large pores between clods after application. Proper depth of injection and good soil coverage are a must for application into dry soils.

"Having wing sealers immediately above the outlet port on the anhydrous knife can help close the knife track, limit the size of the retention zone and reduce vertical movement of ammonia," Sawyer says. "Using closing disks on the anhydrous applicator is another option. Closing disks can reduce ammonia loss by covering up the injection track with soil to trap the ammonia as it moves to the soil surface. Reducing the application rate or narrowing the knife spacing can also help by reducing the concentration of NH_3 in each injection band."

Understanding process

What happens when anhydrous ammonia is injected into soil? Several physical and chemical reactions take place, says Sawyer. There's dissolution in water, reaction with soil organic matter and clay, and attachment of the resulting ammonium ions onto soil. These reactions all tend to limit the movement of ammonia, with water having the greatest initial effect.

The highest concentration of ammonia is at or near the point of injection, with a tapering of the concentration toward the outer edge of the retention zone. Usually the greatest ammonia concentration is within the first inch or two of the injection point with the overall retention zone being up to 3 to 4 inches in radius in most soils. Size and shape of an ammonia retention zone varies depending on rate of application, knife spacing, soil type and injection conditions (soil texture, structure, organic matter, moisture status).

Ammonia moves farther at injection in coarse-textured soils and soils low in moisture. Also, if the injection knife causes sidewall

smearing (when soils are wet), the ammonia may move back up the knife slot. Movement toward the soil surface can also occur for some time after application if soil dries and the knife track "opens up" as soil dries. There's also less soil moisture to retain free ammonia in solution with drying soils.

A similar movement within the soil can occur if soil breaks into clods at application and there are large air voids left in the soil and poor coverage of the knife track. These conditions can result in greater ammonia concentration toward the soil surface, and greater potential for loss into the air at or after application.

Chemical and biological reaction

When ammonia (NH_3) is injected into soil, the initial reaction at the point of release is violent, Sawyer says. Ammonia reacts and binds with soil particles such as organic matter and clays. It reacts with water to form ammonium (NH_4^+). These reactions help retain ammonia at the injection point. Soil moisture is important for limiting movement of ammonia but doesn't ultimately determine retention in soil. After conversion to ammonium, this form of N is held on soil and doesn't move with water. Only after conversion to nitrate (NO_3^-), via the nitrification process, can N be lost from soil by leaching or denitrification.

Nitrification is the process by which microorganisms in soil convert the ammonium form of N to the nitrate form. Nitrification occurs first at the outer edges of an ammonia band and progresses inward as the initial effects of ammonia injection decrease and the soil conditions become more conducive to microbial growth. Nitrification rate will slow in dry soil but will resume quickly when soils rewet.

Will it damage corn next spring?

The potential is usually low for fall-applied ammonia to damage corn seed or seedlings next spring. However, if soil remains dry (and limits nitrification), or if the ammonia is injected shallow or there is poor soil structure (ammonia placed near the seed), or the rate of application is high, it's possible for ammonia damage to occur.

The best cure to avoid this is to inject ammonia deep enough with soil coverage to get adequate soil separation between point of ammonia injection and the depth where corn seed will be planted, or to offset the injection bands from future corn rows.

For example, if the injection point is 6 to 8 inches deep, the outer edge of the ammonia retention zone (which would be low in ammonia concentration) is 4 inches from point of injection. If seed is planted at a 2-inch depth directly over the ammonia track, the seed would be outside the applied ammonia band. Shallower injection, greater ammonia movement upward from the injection point, wider knife spacing or higher rates of N applied can lead to ammonia being in the seeding area at rates high enough to cause damage.

"Be mindful of what is happening at application when knifing in anhydrous ammonia, especially if soil conditions aren't ideal," Sawyer advises. "If you make an application round in the field and you can still smell ammonia from that application, then adjust the applicator to get better coverage of the knife track with soil or wait for better conditions."

If soil is breaking into clods, there isn't good coverage of the knife track with loose soil, and ammonia is escaping. Then stop applying the N, he says. "Remember, your nose tells you if ammonia is escaping. A white vapor is condensed water vapor, not ammonia, which is colorless. If you see white vapor emerging from soil after pulling through with the injector knives, then stop and either change the way the equipment is working or is set up, or wait until the soil has better structure or moisture content to get good coverage of the injected N."



December 1st 2022 is the Pioneer Deferred Payment Deadline

VISIT WWW.WILDCATAGRISERVICES.COM - TO LEARN MORE ABOUT PIONEER PRODUCTS!



**WHEAT SCHOOL:
THE KEY TO
PLANTING IN
DRY SOILS**

Type this into the search bar to find it.

Contact Information

PIONEER & WHEAT SEED

Korey Carmichael 316-641-3160
korey.carmichael@plantpioneer.com

TYE ENGEL 316-217-6253
tye.engel@plantpioneer.com

MIKE MCGINN 316-772-7171
mikemcginn@plantpioneer.com

TANNER GATZ 316-284-1597
TGATZ4@gmail.com

Insurance

STEVE MCGINN 316-284-1935
mcginnst@hotmail.com

BILLING QUESTIONS

SUSANNAH MCGINN OFF. 316-772-5050
susannah.mcginn@plantpioneer.com

SEED PLANNING FOR 2023

We have had a few customers starting to get with us on estimates on orders for the 2023 crop year. We know that it seems early, but the sooner we know the demand the better off we will be in attaining additional supplies of the leading hybrids. But it always seems that the early orders have a better chance at the hybrids, varieties, and quantities wanted vs. later orders.

Please let us know if you have interest in getting together to place your order before December 1st 2022.

NATIONAL YIELD CONTESTS FOR 2022

If you are interested in entering into any of these contest please call Susannah at the office to get registered!



WE STILL HAVE SOME SEED WHEAT TO HELP YOU

FINISH PLANTING THIS YEAR!



CONTACT:

TANNER GATZ 316-284-1597

MIKE MCGINN 316-772-7171

TYE ENGEL 316-217-6253

KOREY CARMICHAEL 316-641-3160