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Department of Agronomy

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ANHYDROUS AMMONIA USE FOR CORN William O. Thom

Anhydrous ammonia is the most concentrated form of nitrogen fertilizer available to corn producers in many areas of Kentucky. It is a simple chemical compound made up of one part nitrogen and three parts hydrogen (NH_3), existing as a gas at normal outdoor temperatures. This makes it necessary to store and handle the material in closed containers under pressure. The product contains 82% nitrogen, making it one of the highest analysis and most economical fertilizers available for corn production.

This fertilizer material must be injected into the soil to prevent losses. As soon as NH_3 is injected into the soil it reacts with water or other sources of hydrogen (H^+) associated with organic matter or clay particles in the soil to be converted into ammonium ions (NH_4^+). Ammonium ions are immobile and will not leach, since they are attracted to the negative charges associated with clay and organic matter in the soil. The majority of ammonium ions remains in the soil until soil temperatures rise above approximately 50 degrees F. Ammonium then converts to nitrites and on to nitrates (mobile nitrogen) by soil bacteria. The nitrate is either used by growing corn, leached with downward movement of soil water, lost by denitrification, or remains in the soil solution.

Fall Application

Fall nitrogen applications are not very successful in Kentucky due to frequent periods of above 50 degree soil temperatures during winter followed by heavy spring rainfall. These factors allow conversion of ammonium to nitrate which is followed by likely losses from leaching and denitrification.

Spring Preplant (Conventional Tillage)

All but very sandy soils are suited to spring preplant under conventional tillage. The anhydrous ammonia should be injected 7 inches or deeper in moist but not saturated soils with equipment manufactured or properly modified to handle high pressures. Some type of adequate slit coverage is necessary to prevent the escape of gas directly into the air. The white cloud often observed coming from the slit is not NH_3 , but moisture vapor that forms as the NH_3 lowers the soil air temperature near the point of injection. Normally, corn should not be planted for at least 1 week after NH_3 application. As a safeguard to minimize seedling injury, NH_3 should be applied at least 7 inches deep, and the application equipment should be run at an angle (35-45 degrees) to the row direction.

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Spring Preplant (No-till)

The surface mulch will help soils retain moisture longer in spring resulting in a longer wait before application. The best system of NH_3 application involves injecting in the middle of the rows on fields where corn is to follow corn. Where corn is to be planted for the first time the NH_3 should be injected at an angle (35-45 degrees) to the row direction and at least 7 inches deep. In either case, the injection equipment should be equipped with a single disc opener to slice through accumulated mulch or vegetation, and with a spring loaded wheel or covering device to close the slit. This will require modification of most available equipment. All other precautions under Conventional Tillage should be observed.

Sidedressing

Historically, sidedressing gives the highest efficiency for applied nitrogen fertilizer. A major difficulty in sidedressing is one of timeliness. Sidedressing with NH_3 can be accomplished any time after corn is 6-8 inches (before knee high) to avoid problems with prolonged wet periods and root pruning and stalk breakage when corn is too tall (above knee high). The injection knife should run near the center between the rows to minimize root pruning. Sidedressing can be followed on both conventional and no-till corn. Read other suggestions in the above sections on preplanting.

Rates

Nitrogen recommendations are made by soil testing laboratories regardless of the N source which corn growers intend to use. All research indicates that any source of nitrogen fertilizer, when properly applied and managed, will give equal corn yields.

Cold-flo¹ Ammonia

With the addition of an expansion chamber to the application equipment, the refrigeration action of anhydrous ammonia transforms approximately 85% of the material into a cold liquid. The remaining 15% is a very low pressure gas. Anhydrous ammonia from two outlets is put through a single injection point into the soil as a non-pressure liquid and as a very low pressure gas, thus minimizing the chances for escape. This system can be used at all application times described above.

Precautions

Improperly handled anhydrous ammonia can cause serious injury to humans. Handlers and equipment operators should always use caution when handling or applying anhydrous ammonia.

¹ Patented process of U.S.S. Agri-Chemicals