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Anhydrous Ammonia A Good Nitrogen Fertilizer

M. D. Weldon and W. E. Ringler

What is anhydrous (liquid) ammonia?

How is it stored transported?

Anhydrous ammonia is a concentrated nitrogen fertilizer containing 82 per cent nitrogen. It is a gas at ordinary temperature and pressure. It is usually stored and shipped in strong tanks as a liquid under pressure. The pressure depends entirely upon the temperature. At minus 28° F., the pressure is atmospheric (14.7 lb. per sq. in.); at 32° F. it is 62 lb. per sq. in.; at 100° F. it is 212 lb. per sq. in.; at 124° F. it is 303 lb. per sq. in. The density at 70° F. is 38 lb. per cubic foot (5.1 lb. per gallon).

Ammonia is soluble in water and can be applied in irrigation water by releasing it into the water in the lateral. But it is usually applied by means of a special implement which injects the gas into the soil.

How is it used?

(1) By direct application to the soil

Since anhydrous ammonia is a gas when under atmospheric pressure it must be placed into the soil. Field and row-type cultivators are both adaptable to ammonia injection with the supply tank mounted on the tractor or implement frame. Simple controls are available to meter the ammonia through flexible tubes to applicators mounted on the back edges of the shanks. These are lowered into the ground like a cultivator and as the tractor moves down the field, the ammonia is deposited at the base of each furrow and immediately covered to avoid loss to the atmosphere. The metering device can be set to apply nitrogen at any desired amount per acre. The supply tank on the tractor or implement is filled from a large storage tank on a truck or trailer.

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(2) By application to irrigation water.

Anhydrous ammonia may be applied in irrigation water. The gas will dissolve readily in water and is carried to the soil in the irrigation water. For uniform application it is necessary to have even distribution of water. Application through sprinkler systems is not recommended because of possible loss of ammonia into the air.

In recent years anhydrous ammonia has been successfully used in California as a nitrogen fertilizer applied in the irrigation water and as a direct application for a variety of crops. The direct application of anhydrous ammonia to the soil for cotton, oats and corn is also a successful practice in Mississippi. The chief advantage in the use of anhydrous ammonia appears to be the low cost of production compared with other nitrogen carriers. However, the costs involved in storage and application may offset entirely or in large measure the advantages of the low cost of production.

Experimental results in Nebraska

Field plot tests with anhydrous ammonia and other nitrogen fertilizer indicate that it is about as good as others if applied properly on corn, wheat and brome grass.

For corn and wheat, injection of the ammonia into the soil before planting gives better yields than application at other times.

For brome grass, injection of anhydrous ammonia under the sod in October gives higher yields of hay, pasturage, and seed than application at other times.

The following table shows a comparison of anhydrous ammonia and ammonium nitrate on nonirrigated corn at Lincoln in 1950.

Time of application	Yield of corn in bushels per acre after application of					
	anhydrous ammonia			ammonium nitrate		
	40 lb. N	80 lb. N	Mean	40 lb. N	80 lb. N	Mean
Prior to planting	118	114	116	---	---	---
Corn 5" to 10" high	105	110	108	117	117	117
Corn 20" to 30" high	101	110	106	114	124	119

Yield of unfertilized corn was 92 bushels per acre.

Recommendations for corn

- Rate: Use 40 to 80 pounds of nitrogen per acre on non-irrigated land, 40 to 120 pounds under irrigation.
- Time: Before planting or listing gives best results, but side dressing when corn is 5 to 30 inches high also makes a profitable increase in yield.
- Method: Special implement to place the ammonia into the soil in bands 12 to 18 inches apart and 4 to 6 inches deep. When used as side dressing, it may be applied on one or both sides of row, 3 to 6 inches deep and at least 8 to 10 inches away.

Recommendations for bromegrass

- Rate: For seed production, 60 to 80 pounds of nitrogen per acre. For hay or pasture, 60 to 120 pounds of nitrogen.
- Time: September, October, or November. For hay or pasture, March application is about $\frac{3}{4}$ as effective as October application. Spring application for seed production is not very effective.
- Method: Special implement to place the ammonia into the soil in bands 12 to 14 inches apart and 3 to 6 inches deep.

Recommendations for wheat

- Rate: 30 to 40 pounds of nitrogen per acre.
- Time: Immediately before planting or within a few weeks before planting.
- Method: Special implement to place the ammonia into the soil in bands 12 to 14 inches apart and 3 to 6 inches deep.
- Phosphate: Where wheat responds to both nitrogen and phosphate, the nitrogen should be applied as recommended above, and superphosphate drilled in with the seed at such a rate as to supply at least 20 to 30 pounds of available phosphate (P_{205}) per acre.

