

# Forms of NITROGEN FERTILIZER

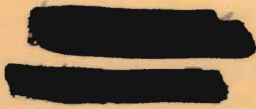
Fertilizer nitrogen is now sold in three forms--gas, liquid and solid. All should be equally effective in securing crop yield responses, when compared on a nitrogen-equivalent basis.

While nitrogen from the three sources is considered equally effective the forms differ in physical properties that require differences in methods of handling and distributing.

Which form of nitrogen fertilizer to use will depend on the comparative price per pound of nitrogen plus the cost of applying and on crop and soil conditions that may limit choice of form because of application methods required.

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## Properties of Different Forms of Nitrogen Fertilizers

Material	Percent Actual Nitrogen	Pressures lbs./sq.in.	Methods of Applying
Gas (Liquid under pressure) Anhydrous Ammonia	82.0	75 at 50°F 197 at 100°F	Needs be applied 4 to 6 inches beneath soil surface to prevent gas escape.
Liquids (Low pressure)			
Water solutions containing free ammonia and ammonium nitrate or urea	from 16 to 40	1 to 17	Needs be applied an inch or two below soil surface to prevent drying losses.
(Non - pressure) Water solutions of ammonium nitrate and urea	from 20 to 32	None	Can be sprayed on soil surface or crop residues or applied in the soil.
Solids			
Ammonium nitrate	33.5		Can be broadcast on soil surface or applied in the soil.
Ammonium sulfate	21.0	None	
Urea	42.0		
Sodium nitrate	16.0		
Cyanamid	21.0		
Combination and mixed fertilizers containing nitrogen	2 to 21		

### Anhydrous Ammonia

Ammonia is a gas at atmospheric pressure and temperatures above minus 28 degrees F. Below minus 28 degrees F. it exists as a liquid. At temperatures above minus 28 degrees F. it is compressed to form a liquid to facilitate storage and handling. When released from pressure it again becomes a gas. A gallon of liquid anhydrous ammonia weighs 5 pounds and contains 4.1 pounds of nitrogen. Concentrated ammonia gas has a stifling odor and is caustic to living tissue. Care must be taken not to breathe it or allow it to come in close contact with your skin, eyes, etc. It can burn plants also on direct contact.

Unless released beneath the surface of the soil (4 to 6 inches) and sufficiently covered, gas escapes and losses may occur. Ammonia is



absorbed on clay and organic matter but must be applied under the surface to facilitate absorption. Losses may occur if the soil is too dry or wet at application time. Good moisture conditions for tillage are good also for its application. No satisfactory methods have been developed for applying it to growing close seeded crops. It has been successfully applied to grass sods, between rows of wide spaced row crops, as a sidedressing, and in preplanting applications.

Anhydrous ammonia is shipped in tank cars of 10,000-gallon capacity. It is stored in high pressure storage tanks. It is delivered to the farm in pressurized tank trucks or trailers and transferred to tanks on special field machines which apply it beneath the soil surface through knife like blades.

Most anhydrous ammonia is applied by custom machines owned and operated by the retailer of the material. Only on larger farm operations, where large amounts of the material are being used, is it considered most economical to own the quite expensive transporting, storage and application equipment required.

Because of its high analysis, transportation and other costs per pound of nitrogen are low. As a result the retail price per pound of nitrogen is usually considerably less compared with other forms. However, the per acre costs of applying it are usually higher. The cost advantage in using it becomes greater at higher per acre rates of application.

### **Low Pressure Liquids**

These materials are water solutions of either ammonium nitrate or urea and some ammonia gas. They must be kept in airtight, low-pressure containers to prevent loss of the ammonia gas in storage. They need be applied in the soil, although it is not necessary to place them so deep or cover them as thoroughly as anhydrous ammonia. Low pressure liquids are often applied in conjunction with some tillage operation. They are corrosive to metals, except aluminum and stainless steel.

Price per pound of nitrogen contained is usually very nearly the same as for solid forms and non pressure liquid forms of nitrogen fertilizer.

### **Non Pressure Liquids**

These have no pressure of free ammonia gas that can escape. They can be stored in open containers and can be sprayed on the soil surface or on crop residues without loss of fertilizer materials on drying. They are often applied by means of dribble tubes attached to cultivators, as side dressings for row crops or in conjunction with other tillage machine operations before planting.

Except with very light applications, there is danger of burning leaves if non-pressure liquids are applied to the foliage of growing crops.

They are corrosive to metals. Tanks and spray equipment should be stainless steel or aluminum in order to avoid corrosion. Weed sprayers made of other metals may be used but need to be washed thoroughly clean immediately after use to minimize corrosion.

Non-pressure liquids are usually made by dissolving ammonium nitrate or urea, or mixtures of the two, in water. These should not be confused with liquid fertilizers being sold that contain other nutrients such as phosphorus, potash, minor elements, or hormones and vitamins.

### **Solid Nitrogen Forms**

The solids are the more familiar dry salt forms of fertilizer. For many crops and conditions in North Dakota much of the nitrogen fertilizer used is as dry mixed fertilizer containing other nutrients, or as combination fertilizers such as ammonium phosphate .

Where the phosphorus or potash is to be applied through planter or drill attachments at seeding time and the amount of nitrogen to be applied to the crop is small, combining the fertilizers in one application will likely continue to be done.

It is only where higher rates of nitrogen are to be used, or where there is no need for phosphorus or potash, that the three forms of straight nitrogen fertilizer will be used.

Dry forms lend themselves to a wide variety of methods of application. They can be applied on or beneath the soil surface, by drill or planter attachment at seeding time, or broadcast before planting and in growing crops. The same equipment used for other dry fertilizer applications can be used for the solid nitrogen fertilizers.

Many farms have buildings suitable for storage of dry forms allowing for purchase when available and convenient. When not properly stored, solid forms may take up moisture from the air so that they cake or do not flow freely, with resulting difficulties in application.

The chief disadvantage with solids is the hand labor involved in lifting and handling sacks. The liquid or gas forms avoid hand labor by transferring materials by gravity or pump.