



Cattle Producer's Handbook

Nutrition Section

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Ammoniation and Use of Ammoniated Low-Quality Roughages

*Randall D. Wiedmeier, Linden K. Greenhalgh, and Dale R. ZoBell
Utah State University*

Of all the chemical treatments devised and tested to improve the digestibility and intake of low-quality forages, ammoniation has become the most popular method in practical application. Ammoniation involves sealing forages in polyethylene and injecting anhydrous ammonia through feeder tube(s).

Anhydrous ammonia easily permeates the tissues of low-quality forages and mixes with the water in the forages to form ammonium hydroxide. Treating low-quality forages will usually increase intake by about 17 to 18 percent and digestibility by about 20 percent. This is dependent on forage type.

Advantages of Ammoniation Compared to Other Treatment Methods

Anhydrous ammonia is commonly used as a nitrogen fertilizer. It is widely available, particularly where cereal grains are grown and straw and stalks are available. In addition, most agricultural supply firms are trained and equipped for proper and safe use of the chemical.

Anhydrous ammonia treatment generally increases the crude protein (CP) content of low-quality forages by 1.5 to 2.0 fold. For example, ammoniation of cereal straws typically increases CP from 3-4 to 6-8 percent, however, CP is in the form of nonprotein nitrogen (NPN). The NPN supplies nitrogen required by ruminal microorganisms to ferment fiber, but none of the other raw materials needed by these microorganisms for efficient fiber utilization. As a result, the additional CP from NPN is useful, but not as useful as from natural CP sources.

Ammonia is also effective at neutralizing some toxins, such as those produced by certain molds. For example, ammoniation is a common method of detoxifying feeds that are contaminated with aflatoxin, a powerful carcinogen.

Ammoniation can also preserve feeds by inhibiting the growth of molds, etc. Many household disinfectants contain ammonia for this reason.

Ammoniation does not add high amounts of minerals as do other methods. Although it is generally reported that sodium hydroxide treatment improves low-quality forage utilization more than ammoniation, high levels of sodium intake may eventually reduce animal performance. Calcium hydroxide treatment may also result in high calcium intake that could interfere with the metabolism of several other minerals. These types of treatments are effective but are usually too expensive.

The ammoniation procedure is much more compatible to on-farm treatment than other hydroxide methods that may require grinding, soaking and drying, or specialized equipment for spraying. Low-quality forages can be ammoniated after stacking regardless of the size and shape of the bale package. The size of the stack that can be treated is limited only by the size of the polyethylene stack cover that is available.

Description of the Ammoniation Process Roughage Sources

A stack of forage should be ammoniated only if it qualifies as low quality. It should be below 6 percent CP and higher than 70 percent neutral detergent fiber (NDF). Ammoniating higher quality grass forages can cause the formation of toxic substances because ammonia reacts with free sugars in the forage. Usually, when forages are over 70 percent NDF, free sugar content is minimal.

Conversely, it is not economical to ammoniate forages that are too low in quality. This category includes forages that are below 3 percent CP or higher than 80 percent NDF. Poor quality forage of this type may result from getting wet and lying in the field too