Fermentation of Ground High Moisture Corn Treated With Aqueous Ammonia

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Treating corn silage at ensiling time with aqueous ammonia, or anhydrous ammonia by use of a cold chamber, is reported to produce a high quality product containing more nitrogen, less solubilized corn plant protein, and greater quantities of organic acids than untreated corn silage. Whether treating ground high moisture corn grain before ensiling would induce similar changes was uncertain. This preliminary study was initiated to determine if favorable alterations in fermentation could be induced by ammonia addition and, if so, what level of ammonia would be needed.

Aqueous ammonia was applied to ground high moisture (27 percent moisture) corn grain to supply 0.0, 0.1, 0.15, 0.2, 0.3, 0.4, 0.6, 0.8 and 1.2 percent ammonia. After thorough mixing, material was packed in eight replicate lab silos (quart glass jars), sealed, and allowed to ferment for 7, 14, 28 or 56 days. Upon opening, pH, lactate, ammonia nitrogen (N), total N, soluble N, and soluble non-protein N were determined.

Untreated material had the lowest pH (Figure 1) in each time period, and pH declined through 28 days at all treatment levels. Lactate (Figure 2) generally increased with time ensiled. Ammonia additions from 0.1 through 0.4 percent increased lactate levels over the control (0 ammonia), with peak lactate levels appearing at 0.3 or 0.4 percent ammonia. Higher ammonia levels, 0.6 through 1.2 percent, inhibited fermentation. Soluble nitrogen (Figure 3) increased with time, and ammonia additions slightly reduced solubilization of corn protein.

This preliminary study indicates that low levels of ammonia, below 0.4 percent, will stimulate fermentation and increase lactate production. With levels of 0.3 percent ammonia or less, resulting pH was low enough for good preservation, and no noticeable ammonia odor was present. Higher levels of ammonia, 0.6 percent and above, inhibited fermentation. Such material may not preserve for extended time periods and may have objectionable odors due to residual ammonia.

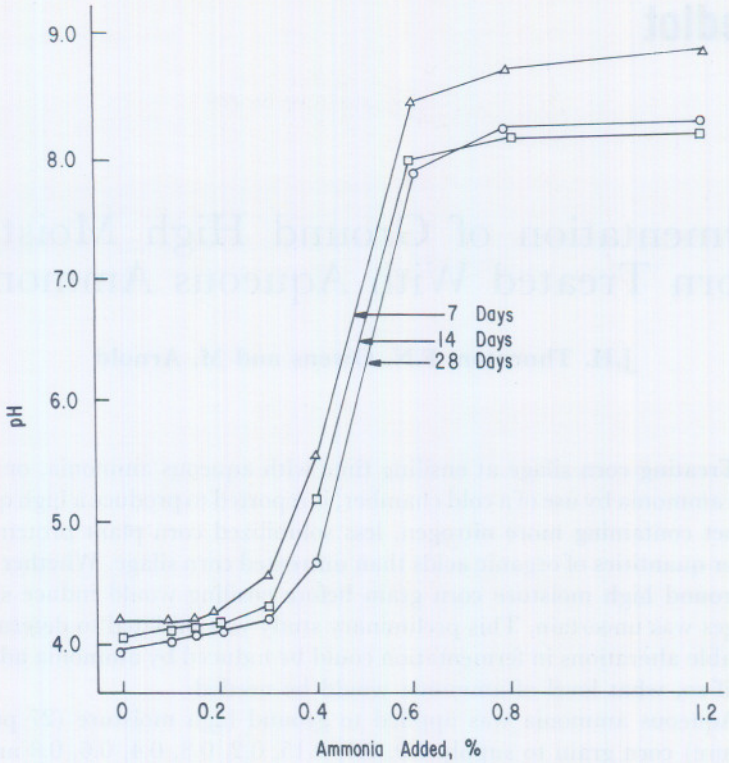

Figure 1. Effect of ammonia additions and time after ensiling on pH of ensiled ground high moisture corn grain.

Based on this preliminary study, a larger quantity of ground high moisture corn grain was treated with 0.3 percent ammonia and a feeding trial with this material is currently underway.

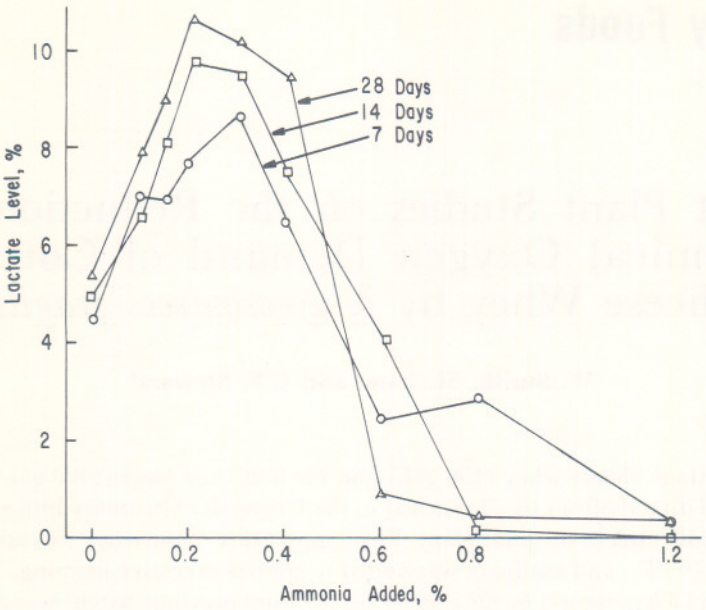

Figure 2. Effect of ammonia additions and time after ensiling on lactate of ensiled ground high moisture corn

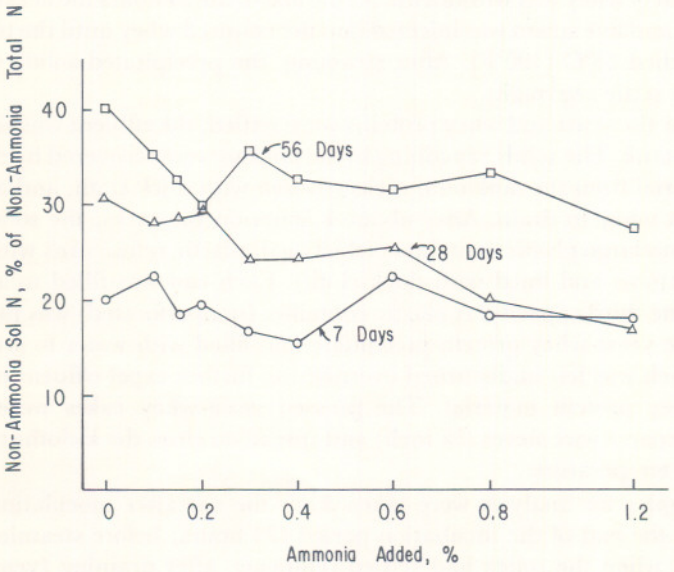

Figure 3. Effect of ammonia addition and time after ensiling on non-ammonia soluble nitrogen