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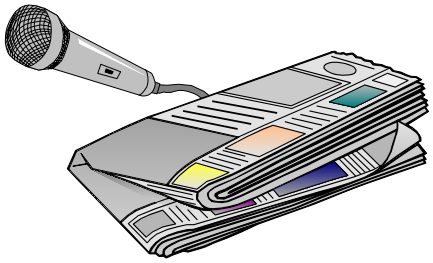
Agriculture Home Economics 4-H

GLENN COUNTY COOPERATIVE EXTENSION NEWS FLASH



September 8, 2003

Extension Notes by Barbara Reed

SILAGE GAS CAN BE DEADLY!!

On a recent farm call, I ran across a problem I haven't seen in the 15 years I have been a farm advisor. A bunker silo being loaded with corn silage was discharging brownish yellow gas fumes. These fumes were significant in quantity and caused a burning sensation in my throat and lungs. These silage gases can be lethal if you don't take precautions. Protect yourself and your livestock from injury or death by avoiding this potential danger.

Silage fermentation may produce several kinds of gas, including carbon dioxide and nitric oxide. Although carbon dioxide is non-poisonous, it can cause suffocation in closed spaces. Nitric oxide changes to nitrogen dioxide when it contacts oxygen in the air. Nitrogen dioxide (NO_2) is poisonous and can injure and kill people as well as livestock.

Midwest farmers have reported serious lung injury from inhaling small amounts of silage gas, and some have suffered permanent damage. Silage gas severely irritates the upper respiratory tract and may inflame the lungs, even though the farmer may experience little immediate pain or ill effects. However, he may die later due to fluid that collects in the lungs. Most people who develop the initial symptoms also develop additional symptoms. Frequently, a relapse with symptoms similar to pneumonia occurs one to two weeks after initial

recovery from the exposure. In the Midwest, these exposures occur in closed spaces. **Nitrogen dioxide is a hazard on the farm because even a brief exposure can be fatal.**

Shortly after ensiling green plant material, oxygen is used in fermentation and the nitrates in the plant are released as nitric oxide (NO). This gas quickly escapes from the silage and combines with oxygen in the air to form toxic nitrogen dioxide. The lethal gas is yellowish-brown in color and smells like some laundry bleaches. After more oxidation, it forms N_2O_5, which then forms highly corrosive nitric acid when combined with water. Since oxidation may occur in the lungs, nitrogen dioxide can produce permanent lung damage.

Because nitrogen dioxide is heavier than air, in covered horizontal pits it sinks down under the silage cover and settles out through the edges of the tarp. It may also seep out the base of the silage pit. It leaves a yellow stain on silage, wood or other materials it contacts.

The greatest danger from nitrogen dioxide gas from silage is during the first 12 to 60 hours after filling. However, take care to avoid possible exposure for 10 days after filling the silo, and when uncovering the pit for feeding. Be on the alert for bleach-like odors and/or yellowish-brown fumes in or near the silo. Small amounts of the gas may not be visible or easily detected by smell, but are still dangerous. Stay out of and away from the silo right after filling and during the following 10 days. If you must enter, work around the pit use a large fan or blower to move accumulated gasses. If you experience the slightest throat irritation or coughing around the silage bunker, get into fresh air quickly and stay away from the silage area as long as gas may be present.

Some environmental conditions (particularly drought), cause nitrates to accumulate in plants fertilized with nitrogen, even at recommended rates. But by taking precautions, you may fertilize at recommended rates for maximum production of silage crops without fear of nitrogen dioxide production. Proper fertilization, combined with good cultural methods (proper weed, insect and disease control), reduces the chances of nitrogen dioxide gas production when you ensile the crop. Work with your Cooperative Extension farm advisor or Certified Crop Advisor to determine appropriate fertilization rates for your crop.

Conveniently for us, silage corn content of nitrogen in pounds per ton of harvested crop at 30% dry matter is numerically equal to the percent protein of that material. For example, if the protein content at harvest is 9%, the harvested crop contains approximately 9 lb nitrogen/ton of yield, expressed at 70% moisture or 30% dry matter. If that crop yielded 35 ton/acre (70% moisture basis), it would contain 9 x 35 = 315 lb N/acre.

Nitric oxide gas is produced from ensiled plants that contain tree nitrate (NO3-) which hasn't been converted to protein. Normally, nitrogen is taken up by plants as nitrate and converted to protein during growth. But when plant growth is retarded by adverse growing conditions or when excessive amounts of nitrogen are available in the soil, nitrates not converted to protein accumulate in the plant stems and leaves. Plants store nitrate if they take up more than they can convert to protein, some plants store more nitrate than others. When such plants are ensiled, the nitrate present may be converted to nitric oxide or it may be lost in the seepage. Even though much nitric oxide escapes during ensiling, enough nitrate may remain in the silage to poison livestock in feeding. Over-application of nitrogen or underestimating soil nitrate can lead to high nitrate levels in plants. An excellent publication on nitrate poisoning in livestock is published by the University of Wisconsin Extension **http://www.uwex.edu/ces/forage/pubs/nitrate.htm** . This information was adapted from Fact Sheet A1871, a series of the Department of Agricultural Journalism, College of Agricultural and Life Sciences, University of Wisconsin-Madison, Madison, Wisconsin, 53706.

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