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NITROGEN AND THE 1994 CORN CROP

In the July *Farm Report* we noted that the pre-sidedress nitrate tests (PSNT) we did on five of our corn fields showed surprisingly low nitrate levels. Levels ranged from 3 to 13 ppm; supplemental N is recommended if the concentration is under 21 ppm. Since research has shown a high confidence level in PSNT results, we applied sidedress N in several cases where Cornell soil analyses indicated a need for none.

In response to our article we got a letter from Jean-Louis Bolduc, an agronome in Ste. Hyacinthe, Quebec indicating that he too was finding unusually low PSNT readings, even where plenty of manure was used the previous fall, and he sees a lot more of these analyses than we do. We called the UVM lab which did our tests and yes, they were finding very low PSNTs.

We have a theory why PSNT levels were low this past spring. The winter of 1993-1994 was almost perfect for alfalfa: Snow cover came early and stayed late, very little frost in the ground except where the wind blew the snow away (a fellow doing some late winter digging reported only a few inches of frost beneath snow-covered fields), and spring snowmelt that was so gradual that we saw little ponding of water in fields as the water went *through* the soil profile rather than *off* it. However, as the water went down, so did some of the nitrogen. This theory hasn't been universally embraced; a couple of agronomist friends think that the problem was due to slow warming of the soils this spring, thus delaying nitrate release. Therefore, when we did our tests, they think the soil was too cold to give a true indication.

Chazy weather data doesn't back up their theory, though. Cornell maintains a weather station here at the Institute and continually records soil temperatures at 4" and 8" depth. We soil sampled (to a depth of 12") on June 16 and 21, midway in the hottest June in over 30 years, and on those dates the soil temperatures at 4" and 8" ranged from 70-76 F, considerably warmer than the same dates in June 1993.

The icing on the cake appeared in October when Paul Sirois, manager of the NEDHI forage lab, ran an item on the DAIRY-L computer bulletin board reporting a lot of corn silage testing in the 5-6% crude protein range, far below the normal 7-8% CP. About 10-20% of corn silage samples are testing low. If we entered the growing season with low soil nitrate levels, and if farmers didn't increase fertilizer N rates accordingly, then we could expect N-deficient corn and low protein corn silage.

The evidence is mostly circumstantial, but until a better explanation comes along, we like this one. (By the way, our corn silage averaged over 8% CP on three fresh chopped samples.)

Ev Thomas

CROP NEWS FROM CORNELL

Cornell held its annual Field Crop Dealer meeting in Canton in October. This is always an excellent meeting, too bad more agribusiness reps don't attend. A couple of highlights:

Seed supplies are the best in years, with adequate supplies of just about everything, even reed canarygrass. Timothy and canarygrass prices should be down a bit. **Corn plant populations** are too low on many farms. Cornell has enough recent research on this to have increased their recommended plant population. You should

The ammonia problem is not unique to dairy barns either. I have only been in one horse barn where I haven't detected ammonia. In some the ammonia odor is so strong it would make your eyes water. Just think what it must do to the animals that must live there.

Most of the ammonia we smell is generated when urea in the urine is acted upon by the enzyme urease. Urease is found just about everywhere and the rate that it is able to release ammonia is dependent on the presence of urea and temperature. That's why we seldom notice ammonia in the barn in February, not because the -30°F temperatures have frozen our nostrils!

Ammonia is water soluble, so that in the lagoons most ammonia generated is solubilized. It is only when we begin agitating that it gets released.

So what's so bad about ammonia? Isn't it good for the crops?

In terms of animal health prolonged exposure to ammonia can cause respiratory problems. Ammonia is caustic and in high concentrations can burn the mucous membranes.

The ammonia in the lagoon, because it is solubolized in the water, has the potential to enter the water supply. When ammonia enters a stream it creates an added oxygen demand. Remember that one? In addition, ammonia at concentrations exceeding 2.0 mg/L is toxic to aquatic life.

Wastewater treatment facilities with ammonia limits may not discharge effluent with ammonia levels exceeding 4.0 mg./L in winter and 1.5 mg/L in summer. Water samples from streams in agricultural regions reveal ammonia concentrations ranging from 26 mg/L to 1,519 mg/L.

So what is the potential in raw manure? The ammonia concentration can be as high as 10,000 mg/L, so as little as one gallon of raw manure in roughly 5000 gallons of water, or the equivalent of one shot glass in a bathtub of water, would result in a fish kill. Manure analysis of our dairy manure shows an ammonia level of 16 lbs/ 1000 gal or 1,917 mg/L.

Once the manure is applied to the land, ammonia can still cause concern. Aside from the potential for surface runoff, the ammonia can be converted, eventually, to nitrate in the soil environment.

The potential for problems associated with ammonia from manure is high. Ammonia can cause respiratory problems, fish kills, and result in elevated nitrate levels in our soils in handled inappropriately.

Next month I'll delve into some ways to minimize the adverse effects of ammonia from manure.

-- *Bob Allshouse*

Corrected Manure Expression from last month's Farm Report

Last month's article about 'How is manure expressed ?' contained an error in the table. It seems that when diskettes were transferred from computer to computer and from version to version that a 7 was lost in the amount of phosphorus (P) in dry manure. The table that was printed listed only 2 lbs of P/dry ton of manure; it should have read ***27 lbs of P /dry ton of manure***. Sorry about that !

David Lang

Why is Phosphorus Movement Important ?

Movement of phosphorus from agricultural fields to natural waterways is a concern that dairy farmers need to address. A recent Circuit Court decision in Castile, NY ruled that large operations with more than 700 animals were feedlots subject to pollution discharge permits under the Clean Water Act. It even ruled that pipes, culverts, and trucks can be considered point sources of pollution. Coliform, cryptosporidium and other bacteria are the major health concern, but P is a general environmental concern affecting the health of our waters, particularly Lake Champlain. But wait ! Phosphorus is a fertilizer that needs to be recycled back onto production fields through proper manure applications. So why is P considered a pollutant ?

Soils and bottom sediments adsorb large quantities of P, but water dissolves it and makes P available to aquatic plant life such as algae. Large algae blooms clog waterways and when the algae dies it decays and consumes oxygen causing fish kills. The controversy between agriculture and environmentalists is a question of how much P in water is too much and how much in runoff entering water bodies is too much. Each water body will differ in its ability to receive or adsorb added P. There is a decrease in P concentration as P leaves the agricultural field into drainage ditches, small streams and rivers before it finally reaches the lake so it's confusing to try to understand all the numbers. For example, Lake Champlain has P concentrations ranging from 0.011 mg/L, which is considered slightly mesotrophic (somewhat nutrient-limited) in the main lake, to as high as 0.06 mg/L or highly eutrophic (nutrient-rich) particularly in the south end of the lake. Phosphorus inputs from point sources (sewage and industrial outlets) and non-point sources (runoff and precipitation) will slowly increase the P concentration in Lake Champlain. It's interesting to note that rainwater has a P concentration of 0.01-0.02 mg/L so not all the P is coming into the lake from land sources.

Concentration of P in runoff is higher than the final lake concentration and ranges from 0.01 mg/L to 1.0 mg/L or more. "Safe" runoff levels are controversial and may range from 0.1 to 0.4 mg/L depending upon the receiving waterbody's capacity to adsorb P. Is there a direct relationship between soil test P levels and the potential for P to move in runoff ? Generally yes, depending upon the flooding and erosion potential of a particular site. Another question of interest is whether P moves through the soil and into tile drainage. In September's Farm Report, we reported that P from manure and fertilizer applications did not move below the plow layer (6-8").

The following table compares extractable soil test P with P dissolved in water from soil taken at the soil surface and from the subsoil just above tile drainage. Soil taken from the soil surface from fields R20 and R5NT had water dissolved P above 0.4 mg/L which might be a problem if erosion or flooding occurred. It should be pointed out that this value was derived from a laboratory extraction and does not represent an actual runoff concentration. Rather, it is the potential concentration of runoff water. Extractable and water dissolved P from the subsoil were generally very low except for R-20. R-20 is a tile drained field with a high clay content that has the ability to adsorb and release high amounts of phosphorus. More detailed measurements from an agricultural field and a nearby wooded wetland with a similar soil will be initiated this fall. Lysimeters (shallow sampling wells) will be installed to monitor P and other water quality parameters. Hopefully, this will confirm our preliminary conclusion that P is not moving into tile drainage above levels normally found in wooded wetland soils adjacent to the drained field. This study was supported in part by the funds of USDA Agreement 91 COOP-1-6593.

Phosphorus movement potential from surface runoff or through tile drainage.

	Field[1]			
	M12	R5NT	R20	R38
Phosphorus		0-1" Depth		
Extractable[2] P mg P/kg soil	1.1	36.5	10.0	5.5
Dissolved[3] P mg P/L H_20	0.11	0.79	0.41	0.07
Phosphorus		16-24" Depth		
Extractable[2] P mg/ P/kg soil	0.4	0.9	2.8	0.7
Dissolved[3] P mg P/L H_20	0.08	0.06	0.11	0.07

[1]Field
- M-12: Malone Sandy Loam; No Manure since 1981
- R5NT: Hogansburg Stony loam; 40 Tons Manure /Ac since 1981; 15-20 Tons/ Ac/Year from 1960-1975.
- R20:Adjidaumo Clay; 110 Tons Manure/Ac since 1981.
- R38: Hogansburg loam; 175 Tons Manure/ Ac since 1981.

[2]UVM Soil Test P
[3]Soil saturated and extracted with water.

David Lang

FALL ALFALFA QUALITY FLASH

If you haven't yet tested alfalfa harvested in from mid-September on, better do so before you start feeding it. We just got a forage analyses back on some late third cut which we sold to a neighbor. We sold about 30 acres of clear alfalfa. Because we had no place to put most of our third cut, we left the alfalfa until we found a buyer. We took second cut later than normal, August 8, because we had a devil of a time trying to make baled hay during the summer's frequent rains. Third cut didn't come off until October 11, which is a **64 day** harvest interval. When mowed, the alfalfa still wasn't in bloom, not really unusual for late season alfalfa this far north.

Crude protein is very decent, at 22%. However, ADF and NDF are 25% and 32% respectively, NSC is 34%, and Relative Feed Value (RFV) a nice round 200. That's great alfalfa to brag about, at least to folks who have never had to feed the stuff. But for the farmer who has to feed it, the low NDF level can pose quite a problem. We've talked to the purchasers of this forage to advise them of what they have lurking in their silo.
We told them to mix this with second cut alfalfa haylage, which if it's like other we've seen from this summer has *plenty* of fiber..

During the cool nights of autumn, alfalfa adds dry matter but not much fiber. (Long, hot summer nights are great for corn, but lousy for alfalfa quality.) Think about the size of the leaflets on fall alfalfa vs midsummer alfalfa: July leaflets are about the size of a mouse's ear, while the leaflets grown in the fall are the size of a quarter. This fall, alfalfa leaves were especially large; we were in a field of 4th cut at Remillard farm in Peru and remarked at the huge leaflets. Well, the Remillards harvested the field, and have the forage analysis back. It bears a striking resemblance to our third cut, not surprising since it was harvested at about the same