QUESTIONS FROM THE FLOOR

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Q: *Given the great advances of biotechnology, especially by some of your colleagues in the CALS, UW-Madison, do you think we'll ever see N-fixing bacteria adapted to the turfgrass varieties we use on our golf courses? (SHEBOYGAN COUNTY)*

A: My opinion is that this will not happen. You may have noticed that during the past year or two very little has been reported in the press regarding incorporation of N-fixing capability in the grasses. The basic problem is that biological N fixation can only occur in the total absence of oxygen. Nodules on legumes provide such an environment. No one has been successful in isolating an N-fixing microorganism that will infect and form nodules on grass roots.

Q: *I learned a lot from your recent article in* THE GRASS ROOTS *about "Best Management Practices for Turfgrass." Can you explain to me the difference between BMP and IPM (integrated pest management)? Or are they essentially the same thing? (MONROE COUNTY)*

A: Integrated pest management is a part of what is now known as "best management practices" (BMP's). The other part of BMP's is that which focuses on nutrition and cultural practices other than pests. Thus, BMP encompasses IPM.

Q: *A sales representative who regularly calls on me is pushing hard to sell me a product high in manganese. He says it's an excellent material for adding green color to turfgrass (he calls it a "stain"). Is this legitimate? Is it phytotoxic? Could toxic levels build up in the root zone? How safe would you guess such a material to be? I have 25 years of experience in Wisconsin's golf turf industry; never before has anyone tried to sell me manganese. Any advice? (PORTAGE COUNTY)*

A: To date, the only confirmed Mn deficiency on field-grown turfgrass that I'm aware of occurred in bermudagrass in Florida, growing on what was once a very acid sand but whose pH over five years had risen from 5.2 to over 7.0 because of the high calcium content of the irrigation water used. Florida researchers studied the problem and concluded that applications of manganese sulfate or chelate could correct the problem temporarily. Long-term correction of the deficiency was achieved only by applying ammonium sulfate to reduce soil pH.

These same researchers also cautioned against applying Mn to large areas. Rather, they recommended dissolving 0.4 oz. $MnSO_4$ in a gallon of water and spraying an area to the drip point (i.e., until drops form on the turfgrass and begin to run off the leaves). Response to the Mn will show up in a week or two **if the turf is Mn deficient.** Unless the turf was chlorotic to begin with, the only response you can expect is a faster growth rate.

I seriously doubt whether there is any Mn-deficient turf in Wisconsin. If one were to look for some, you'd want to seek out areas where the turf was established on highly acid (pH 5.0 or less) sandy soil and the pH subsequently adjusted to 7.0 or higher through liming or use of "hard" irrigation water. You would then look for turf in which the youngest leaves are chlorotic and the older leaves have yellow-green spots.

I'd venture to guess that the Mn rates being recommended for turfgrass will not cause phytotoxicity unless used for several seasons on turf with naturally high Mn levels. In general, this will be the case only where the turf is being grown on poorly-drained mineral soil.

Q: *How likely is nitrogen used in golf course fertilization programs to enter groundwater supplies? (OZAUKEE COUNTY)*

A: At current rates and frequencies of N applications on properly-managed golf courses, chances of groundwater contamination with harmful levels of nitrate are very remote. This is the conclusion recently drawn by several researchers who have studied the problem and reviewed all evidence currently available.

If leaching of nitrate were to be a problem, it would occur on sandy soils or sand-based putting greens treated with excessive rates of soluble-N fertilizer and over-watered. Researchers at the University of Massachusetts recently reported on their research on 80:20 sand:peat greens. When the greens were treated with 0.2 lb N on 7-day cycles or 0.4 lb on 14-day cycles and irrigated with 0.5 inch water three times per week, 46% of the water leached BUT total N leaching losses were less than 0.5% of the N applied. Under these conditions, fertilizer N leaching losses did not differ with the N source applied. When 1.0 lb N was applied all at once, fertilizer N leaching losses averaged 1.2% and leachate nitrate concentrations exceeded the drinking water standard of 10 ppm for the first four days following application of calcium nitrate and ammonium nitrate but not when urea, ammonium sulfate, UF, or IBDU were applied.

Anyone in the turf industry confronted by public concern over groundwater contamination with nitrate from fertilizer needs to point out several key things: (1) Unlike with field crops, the rates of N used are considerably less than those needed for maximum growth. Hence, turfgrass recoveries of fertilizer N are relatively high; (2) When soluble N enters the root zone of turf, the N disappears very quickly from soil solution. Research has shown that 60 to 80% of the soluble N is taken up by the grass and microorganisms within 48 hours after entry into the soil solution; (3) Unlike with most field crops, the N applied to turf is split up into several applications each season. Consequently, soil solution levels of nitrate remain relatively low and any water leaching beyond the root zone has only very low nitrate concentrations; and (4) Turf, because it is a "high-value crop", is often fertilized with