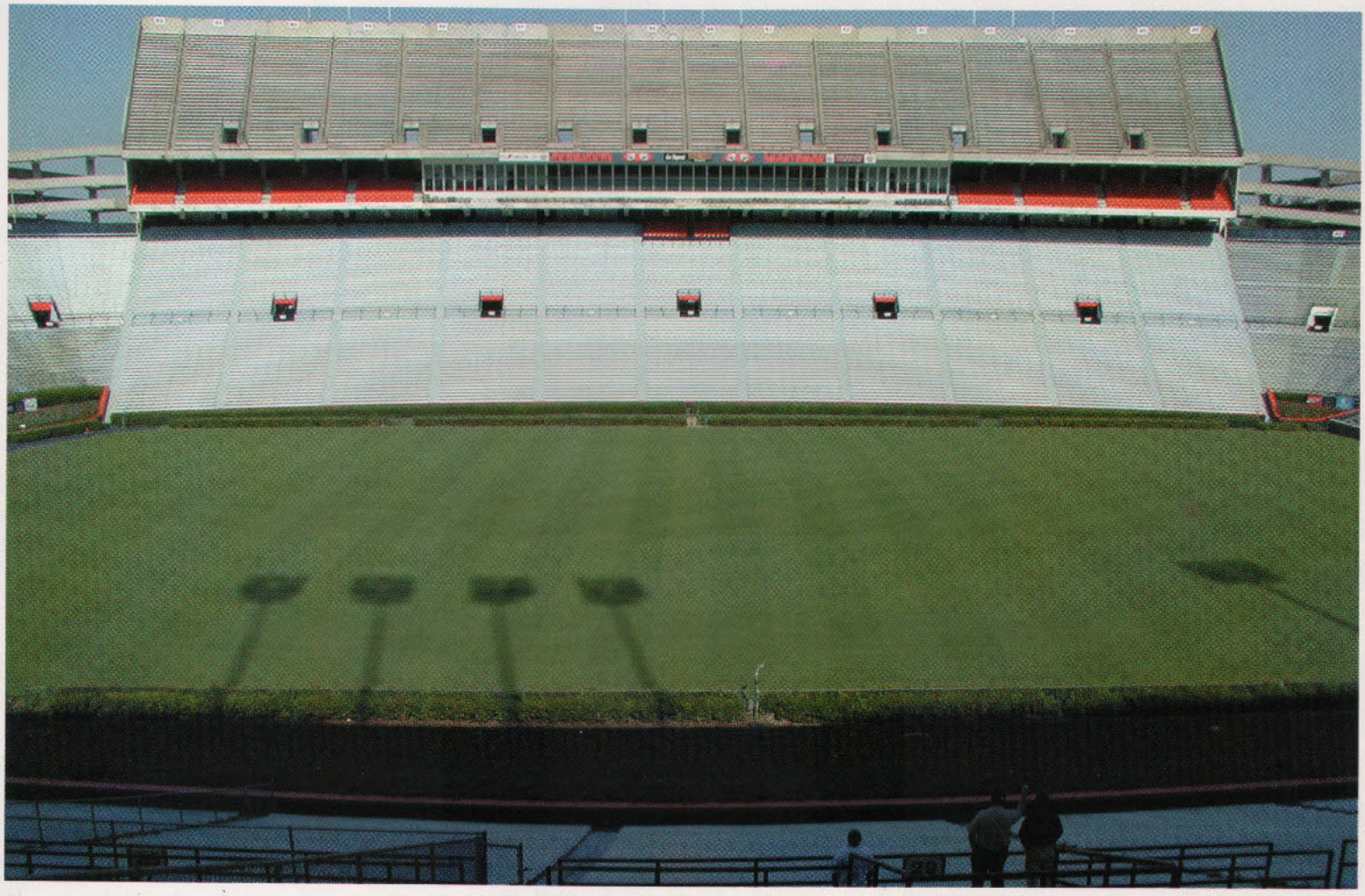
"Micromanaging" your sports turf

By Dr. Beth Guertal

Recently, I spent the better part of my week engaged in e-mail exchanges with soil scientists from all over the country. The topic that held us in such extended discourse? The micronutrient cobalt and whether or not this micronutrient deserved the ranking of "essential element."

What makes an element essential? In general, to be considered essential for plant growth and development, an element must 1) be required for a plant to complete its life cycle, 2) not be substituted by any other element and, 3) be directly involved in the plant's nutrition. Plant scientists pretty much agree on the essentiality of our macronutrients, which are needed in larger amounts by growing turf. Those macronutrients are nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S). Nitrogen, P, and K are typically applied via fertilization, while Ca and Mg are supplied through liming (if lime is needed), or application of non-lime materials such as gypsum, epsom salts, or other fertilizers.

When compared to our general agreement about the number of macronutrients, the number of micronutrients that are considered



Auburn University's Jordan-Hare Stadium in the offseason. Photo by Dr. Guertal.

"essential" is still under discussion, as aptly demonstrated by my recent cobalt debate. In general, plant scientists agree that the micronutrients iron (Fe), manganese (Mn), boron (B), zinc (Zn), copper (Cu), molybdenum (Mo), chlorine (Cl) and nickel (Ni) are considered essential. The micronutrients cobalt (Co), silicon (Si) and sodium (Na) are what many call "quasi-essential," which roughly means that some plants, but not all, have shown a need for that element (Epstein and Bloom, 2005).

For example, we have seen some turfgrasses (Saint Augustinegrass) respond to application of Si fertilizer (Datnoff, 2005). However, the positive response is because Si adds resistance to some turf diseases, and not because the turfgrass could not live without the Si.

So, if iron, manganese, boron, zinc, copper, molybdenum, chlorine and nickel are considered our essential micronutrients, should you be running out to apply these nutrients to your sport fields? In a short answer: mostly no. In a longer answer, let's take a look at each micronutrient separately, and figure out how it works in your sports turf fertilization program.

Guaranteed Analysis

Total Nitrogen (N)	8.00%
1.76% Ammoniacal Nitrogen	
0.04% Nitrate Nitrogen	
3.20% Water Soluble Nitrogen	
3.00% Water Insoluble Nitrogen	
Available Phosphate (P205)	4.00%
Soluble Potash (K20)	5.00%
Calcium (Ca)	7.0000%
Total Magnesium as (Mg)	0.7000%
0.70% Water Soluble Magnesium (Mg)	
Sulphur (S)	3.0000%
3.00% Combined Sulphur (S)	
Boron (B)	0.0200%
Chlorine (Cl) Not more than	0.1000%
Cobalt (Co)	0.0005%
Copper as (Cu)	0.0500%
0.05% Chelated Copper (Cu)	
Iron as (Fe)	0.1000%
0.10% Water Soluble Iron (Fe)	
Manganese as (Mn)	0.0500%
0.05% Chelated Manganese (Mn)	
Molybdenum (Mo)	0.0005%
Sodium (Na)	0.1000%
Zinc as (Zn)	0.0500%
0.05% Chelated Zinc (Zn)	

Derived from:
Chicken Manure, Urea, Anhydrous Ammonia, Cobalt Sulfate, Copper Lignosulfonate, Ferrous Sulfate, Manganese Lignosulfonate, Molybdenum Oxide, Sulfate of Potash, Magnesia, Potassium Chloride, Sulfuric Acid, Boric Acid* and Zinc Lignosulfonate.

Iron

The one micronutrient that does not fit the general "no" offered above is iron. Iron is the only micronutrient that is routinely recommended for application to sports turf. This is because iron can provide temporary turf greenup without stimulating additional tissue growth. In fact, some turf managers will use iron application as a part of their striping program, alternating sprays every ten yards to enhance striping on their football fields.

Iron fertilizer sources include ferrous sulfate (~19% Fe), iron chelates (~5-10% Fe, varying with chelate type and manufacturer), and organic forms of iron such as iron humates (~10% Fe). A "humate" is a mined organic deposit, typically containing a wide variety of micronutrients and usually a little bit of N as well. Chelated and inorganic sources can be applied at light and frequent rates as foliar sprays (1/2-1 lb. actual Fe per acre) (Carrow, et al., 2001). Typically, such applications are made monthly, as the greening effect is short-lived, and frequent mowing will remove the Fe-treated leaves.

Rates of Fe application can vary widely, with granular organic Fe sources safely applied at rates up to 10, or even 20 pounds of Fe per acre. This high rate, however, is for organic products where the iron is derived from humate or waste sources (such as biosolids). Such materials will have a much slower color response, and may not provide the rapid greening provided by soluble sources of Fe. At Auburn we were able to safely apply humate-based iron sources to hybrid bermudagrass at rates up to 20 lbs. Fe per acre. However, when chelated and inorganic sources (iron sulfate) were applied at higher rates (in excess of 5 lbs./acre) we observed significant phytoxicity.

A good rule of thumb for the inorganic or chelated sources is between 1/2 and 2 pounds of Fe per acre, per application. The exact rate will vary with grass species, humidity, and air temperature. Be careful, because the chance of injury (a noticeable black-green discoloration) increases as air temperature increases. Research in Georgia on centipedegrass (a turf sensitive to Fe) showed that iron sulfate or iron chelate applied as foliar sprays at rates of 0.8, 1.6, or 2.7 lb. Fe/acre improved turf color, but phytotoxicity increased as it got hotter. When the air temperature was 70-88 degrees, the highest Fe rate could be sprayed with minimal damage, but when air temperature increased to 85-99 degrees, only the lower rates of Fe could be safely applied (Carrow, et al., 1988).

Manganese

Recently you may have read about Mn fertilization for the suppression of some turf diseases. Research has shown that Mn has some potential for reducing the disease take-all patch (caused by Gaeumannomyces graminis), when it was applied to bentgrass putting greens of a rate of 2 lbs. Mn/acre (Heckman et al., 2003). These results, however, are still specific for one turfgrass species, and one disease, and additional research is needed to see the long-term benefits of Mn fertilization for disease suppression.

In general, the majority of our sports field soils supply more than enough Mn for your turf needs, and additional Mn fertilization is not needed. The application of manganese (1 lb. Mn/acre as a foliar $MnSO_4$ spray) might be warranted if you are growing turf on very sandy soils, or if you have a newly constructed sand-based field that is very low in organic matter. You might also see a Mn response if your soils have a high pH, or have a high phosphorus soil-test. Otherwise, your native soil will provide more than sufficient Mn, and additional Mn is not needed.

The rest of the team

If you were a pecan grower or a sweet corn grower, at this point I might discuss your Zn fertilization program. Likewise, I could spend a few sentences talking about B fertilization of your cotton, soybean, broccoli, or alfalfa crops. In other words, there are specialty crops for which we do make micronutrient recommendations, and the crops will respond and grow when these

nutrients are applied (usually at low rates as foliar applications).

For turfgrass, however, these remaining micronutrients (boron, zinc, copper, molybdenum, chlorine, and nickel) do not need to be applied as supplemental fertilizers, as sufficient amounts are either: 1) already in the soil, 2) applied via dust, irrigation water or in topdressing sand, or, 3) applied via their presence in fungicides. Many fertilizers contain supplemental micronutrients, in granulated blends, or in organic materials. Check the back of a fertilizer bag for the guaranteed analysis; that's the legally required list that gives the percent fertilizer nutrient contents, and it provides the source from which the nutrient was obtained.

In conclusion, managing your micronutrients is pretty darned easy. Consider Fe applications for color, especially when you want to limit tissue growth. After that, if you are managing turf on new sand-based construction or very sandy soils, consider application of a fertilizer that contains a micronutrient package a few times a year. You'll be good to grow!

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References

Carrow, R.N., D.V. Waddington, and P.E. Rieke. 2001. Turfgrass Soil Fertility and Chemical Problems. Sleeping Bear press, Chelsea, MI.

Carrow, R.N., B.J. Johnson, and G.W. Landry, Jr. Centipedegrass response to foliar application of iron and nitrogen. Agron. J. 80:746-750.

Datnoff, L.E. 2005. Silicon in the life and performance of turfgrass. Applied Turfgrass Science.

Epstein, E. and A.J. Bloom. 2005. Mineral Nutrition of Plants: Principles and Perspectives, Second Edition. Sinauer Associates.

Heckman, J.R., B.B. Clark, and J.A. Murphy. 2003. Optimizing manganese fertilization for the suppression of take-all patch disease on creeping bentgrass. Crop Sci. 43:1395-1398.

Hill, W.J., J.R. Heckman, B.B. Clarke and J.A. Murphy. 1999. Take-all patch suppression in creeping bentgrass with manganese and copper. HortScience 34:891-892.

John Mascaro's Photo Quiz

Can you identify this sports turf problem?

Problem: Brown areas on football field sideline

Turfgrass Area: The Orange Bowl

Location: Miami, FL

Grass Variety: 419 Bermudagrass

Answer to John Mascaro's Photo Quiz on Page 45

John Mascaro is President of Turf-Tec International