By Dr. Grady Miller, Environmental Horticulture Dept., University of Florida

Soil pH

A local city hired a company in July to hydro-seed a ballpark with common bermudagrass. They said they watered the seed in and there was rain during that time. The city did a soil test and the pHs ran from 2.3 to 3.9. I went to the park on November 1; in one area of a soccer field, there was a patch about 10 feet in diameter that did not come up, but the rest of the grass had sprouted and was trying to grow. In the baseball field the pH was 2.3. The outfield did not come up except a few seeds did sprout. There are not a lot of weeds growing in the outfield. The grass along 1st and 3rd base lines came up. I told them that I didn't know what would cause the spot in the soccer field not to sprout, and I wasn't sure why the outfield seed did not sprout more seeds and why the grass came up along the base lines. Do you have any thoughts on this? The city has held up the company's check, they want to know why the grass didn't come up.

Bay County

It sounds like these fields were built on a very poor site. The problem seems to be directly related to soil pH, as you speculated. There are likely some other issues that are influencing turf growth, which I will mention, but the overriding problem is pH.

To be honest, I am surprised that anything came up if the pH is indeed around 2.3. That is very acidic. At soil pH below 4.8, aluminum (Al) and manganese (Mn) become much more soluble and can be sufficiently high in soil solution to cause direct plant root toxicity. So the seeds may germinate, but the young roots are damaged almost immediately. These effects can be equally detrimental to turfgrasses or weeds. With low soil pH, Al and/or Mn toxicities often occur in conjunction with other stresses; namely, deficiencies of Mg, K, Ca, or P. At the low pHs mentioned, iron toxicity is possible and high H+ can be directly toxic to plant roots. In some soils, pyrite (FeS_2) can accumulate under waterlogged conditions so that when the soils are drained for development they become extremely acidic as the pyrite oxidizes to generate sulfuric acid. Each of these scenarios provides a harsh environment to establish and grow grass.

The depth of the soil sample for pH analysis may explain the differential success between fields. Usually toxicities are found in the subsoil, even though it sounds like these soils have a pretty low pH through much of the rootzone. After sprouting, some of the plants may have found enough surface soils in the soccer field with an acceptable pH to get established.

When the soil sample was taken, you may have gotten a mixture of the higher pH surface soil and the low pH subsurface soils. The 10-foot diameter bare circle may or may not be due to the soil pH. It is such an isolated incident on the field that it sounds like it could be due to a pathogen (i.e. disease). The length of establishment (July to November) may be due to the generally low pH reducing seedling vigor. In the baseball field, I suspect the pH was generally worse than the soccer field. The grass came up around the baselines due to the clay from the baselines having a higher pH, plus it had a higher CEC that was able to hold on to some of the nutrients.

The other issue I alluded to that may contribute to poor germination is hydroseeding bermudagrass. While hydroseeding is a great way to establish many grasses, I have generally seen better establishment results with bermudagrass (and other warm-season turfgrasses) with drill seeding, or some other type of seeding that places the seed just below the soil surface.

I hate to see bermudagrass established in pHs less than 5.0; especially since the best time to effectively and efficiently alter soil pH is before establishment. With a pH less than 5.0, the soil should have been treated before seeding. Since the baseball field established so poorly, you may want to have a lime requirement test run. Using those results, mechanically mix the required lime to neutralize as much of the acid soil and subsoil as possible. Incorporation is important since lime that is only surface applied takes years to penetrate very deeply into the profile.

Once the turf is established, surface applications of lime every 3-6 months may be needed to maintain healthy turf. To determine how liming treatments affect pH below the surface, soil samples can be collected from deeper depths, such as comparing 0 to 3, 3 to 6, 6 to 9 and 9 to 12 inches. While this level of attention may sound excessive, the very low pH values of these fields are going to warrant more inputs to maintain functional athletic fields. ST

Have Questions?

Send them to Grady Miller at the University of Florida, PO Box 110670, Gainesville, FL 32611, or email gmiller@mail.ifas.ufl.edu. Or, send them to Dave Minner at Iowa State University, 106 Horticulture Hall, Ames, IA 50011, or email dminner@iastate.edu.