Power of Hydrogen Is a Curious Thing

BY KARL DANNEBERGER

The term pH measures the acidity or alkalinity of a solution. More specifically it is the measure of the hydrogen ion (H+) concentration. Danish chemist S.P.L. Sorensen introduced the term pH for a shorter version of "power of hydrogen."

The pH scale is 1 to 14 with 7 being neutral. At a pH of 7, the H+ concentration is equal to the hydroxyl (OH-) concentration. A pH less than 7 is considered acid (> amount of H+), while values higher than 7 are basic (> OH-). Since pH is a logarithmic scale, the H+ concentration difference between a pH of 5 and 6 is tenfold. Thus, moving from a pH 7 to a pH 5 is a hundredfold increase in H+ concentration.

Although pH of solutions in our everyday life can range along the entire scale, the common range for soils is 4 to 10. Turfgrasses vary in their adaptation or tolerance to pH. Cool-season turfgrasses tend to be more tolerant of acidic pH extremes, while warm-season turfgrasses, depending on the species, are tolerant of both acidic and basic conditions.

The greatest impact pH has on soils is nutrient availability. The pH can influence the balance of cations and the nutrient's chemical form. In addition, pH influences and alters microbial activity associated with the transformation process of nutrients like nitrogen and sulfur. Calcium availability can decrease with increasing acidity but the likelihood of a deficiency is remote.

As pH values become more acidic, nitrogen, phosphorus, potassium, sulfur and magnesium become potentially less available. Iron, manganese and phosphorus become less available potentially as pH becomes more alkaline.

Adjusting pH is done through liming (raising the pH) or sulfur (reducing the pH) applications. Factors that influence the amount of lime or sulfur needed to adjust the pH depend on the H+ concentration, and cation concentrations. For example, on calcareous soils (pH ~ 8 to 8.2), lowering the pH is extremely difficult because of the amount of — in this case — sulfur needed to neutralize the calcium coming into solution.

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From a sampling procedure, thatch is not normally considered a soil in the sense because it is not considered in soil testing. Thatch can vary in pH and be quite different from that of the underlying soil. Thatch is more reflective of the pH of the irrigation source, rainfall and type of fertilizer used (i.e., acidifying types). Management difficulty can arise where thatch is normally excessive and not normally considered in the soil test recommendations.

Given the properties of thatch — it is relatively porous and has poor nutrient retention — the ability to impact thatch pH is great, which can have a dramatic impact on turfgrass. For example, a calcareous soil that has a significant thatch layer that lowers the soil pH can result in a significant divergence in pH. If the soil tests have not accounted for thatch, lowering the pH through sulfur applications may not reflect the pH change that is occurring in thatch. In this example, repeated applications of sulfur may not lower the soil pH much, but could drastically lower the thatch pH. I have observed where the soil pH may remain relatively unchanged, but the pH of the thatch from sulfur applications is reduced into the range of 2.8.

As with any value or test, pH can serve as an indicator of healthy turfgrass by providing signs of nutrient availability and competitive ability of the turfgrass system. But like any test, you need to know how the measurement was taken and the soil conditions used in the test.

And that, my friends, is much of what you need to know about the power of hydrogen.

Karl Danneberger, Ph.D., Golfdom's science editor and a turfgrass professor from The Ohio State University, can be reached at danneberger.1@osu.