Turfgrass nutrient demand and soil interpretations
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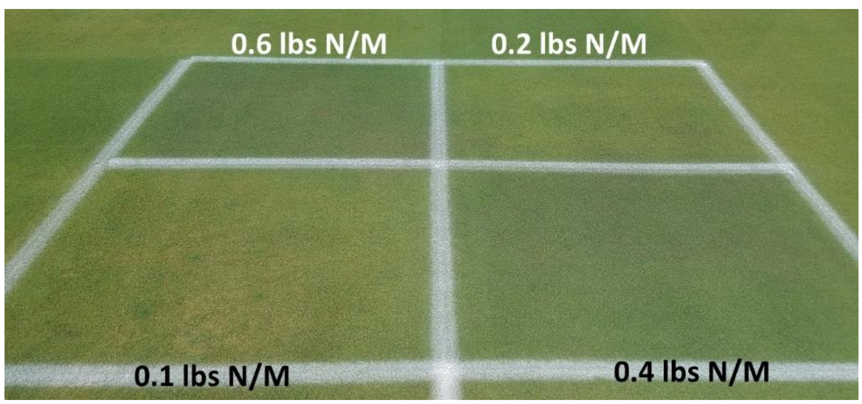
Plants selectively take up different nutrients. As a nutrient like phosphorus (P) is needed, the plant roots take them up. If it is not needed, then P uptake is slowed or stopped. That is why soil testing approaches that look at the relative amounts of nutrients (i.e. base cation saturation ratios – Ca vs Mg vs K) aren't effective. It's more important to focus on the amount of nutrient in the soil. Slow and expensive university calibration tests are required to understand how much nutrient is required in the soil to satisfy plant demand for a particular nutrient.

While universities recommended Sufficiency Level of Available Nutrients or SLAN interpretations, their results are specific to the particular experimental site (soils, grass species, cultivar, nitrogen fertility, etc.). For example, I determined the level of soil test P required to sustain acceptable quality was 7 ppm (Mehlich-3) during my MS. When soil test P levels were below 7 ppm, the grass looked blue and thin. At values greater than 7, the turf quality was acceptable. However, that critical value of 7 was specific to that research green (pure sand, Penn A4, in Madison, WI, and fertilized with 0.2 lbs N per 1000 ft^2 every 14 days). If changed any of those factors and the critical value will change slightly.

Nitrogen fertility has a big impact on turfgrass nutrient requirements. We call this nitrogen-driven nutrient demand. As more nitrogen is made available, through fertilizer applications or mineralization, turfgrass growth rate increases. The plant has to increase uptake of all other nutrients in order to support the increased growth rate. This puts more pressure on the soil to supply those nutrients and increases the critical level.

Figure 1. This whole plot area has very low soil test phosphorus (4 ppm Mehlich-3). Only the high nitrogen treatments have symptoms of phosphorus deficiency. That is because they are growing faster and need more phosphorus to support that growth rate.



We have a research green on East Campus that perfectly demonstrates this nitrogen effect. Some of the plots have not received P fertilizer since establishment three years ago. Soil test P levels are now between 4 and 6 ppm Mehlich-3. These low P sections have been fertilized with different levels of nitrogen fertilizer the past two years. The treatments were 0.1, 0.2, 0.4, and 0.6 lbs N per 1000 ft^2 applied every two weeks.

Beginning this spring, the two high N treatments have had severe phosphorus deficiency symptoms. The 0.2 lb N/1000 ft^2 treatment is fine. The 0.1 lb N/1000 ft^2 treatment has widespread algae but it does not have any P deficiency symptoms. Clearly the 4 ppm P soil works fine if nitrogen fertilizer is less than 0.2 lbs N/1000 ft^2 but was not enough to satisfy plant nutrient demand and higher nitrogen rates.

The take-home message here is not to focus on the specific soil test value, but know that nutrient requirements change depending on factors like soil type, age, environment, and fertilizer management. Those soil test interpretation found on a testing report are not absolute values, but indication of risk of deficiency. In my experience, most of those values are far greater than what the plant actually needs. For example, I say to maintain soil test P level between 20-40 ppm. That is much greater than the 4 and 7 ppm critical values I cited here. A big margin of safety is added to soil test interpretations to account for differences in site, environment and management. If you fear there is a nutrient deficiency occurring, apply a small amount of nutrient to the soil and watch for a response over the next week. If you don't seen anything, then application of that nutrient may not be required.

To learn more about this topics, watch this short YouTube video from June.

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