Soil Amendments Need Continued Study

Finding the right mix for your course requires understanding the underlying soil

BY JAMES MURPHY

Attempts to manipulate and improve soil profiles are an age-old quest. Until the advent of synthetic chemicals, particularly nitrogen fertilizers in the 1900s, animal and green manures were widely used and highly effective for improving soil and plant growth. In the management of golf course turf, amendments can be useful for enhancing soil and plant growth, subsequently producing high-quality playing surfaces.

Desirable soil characteristics for golf turf include adequate fertility, water retention and adequate pore space for plant growth and vigor. Good drainage to remove excess water is also crucial to producing healthy turf. Moreover, the soil surface must be sufficiently firm and stable to support traffic from play and maintenance equipment.

Those familiar with fundamental properties of soil recognize that using amendments to supplement one or more of these soil characteristics may harm conditions for other necessary characteristics. For example, amending soil so that it is firm and stable will often reduce drainage and pore space of the soil, while enhancing water infiltration and percolation with amendments often reduces nutrient and water retention.

Understanding which properties need to be improved for specific soils provides the basis to make decisions regarding amendments. Furthermore, it's often difficult to sort out the veracity of claims associated with the seemingly endless amendments on the market unless superintendents have a fundamental understanding of soil properties. The effectiveness of an amendment depends on its own characteristics, the amount added to soil and the existing soil properties. Many well-established soil amendments, including liming materials and fertilizers, are required by law to provide minimum data on product characteristics so that proper use of the material can be readily determined. Unfortunately, many other amendments have no such requirements. As a result, there is limited information on the characteristics of the materials, making it difficult to assess how useful they would be as amendments.

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In such cases, it is critical that a laboratory test the amendments and soil to evaluate whether an amendment will provide the desired effect(s). Testing data will also provide insight as to how much material is needed to achieve the desired results.

A Rutgers University field study evaluated the effects on the establishment of creeping bentgrass putting greens of sand-based root zones containing various amendments. Root zones were comprised of predominately medium-sized sand (which conformed to USGA guidelines), amended with inorganic and organic amendments. Root-zone mixtures (by volume) included the medium sand mixed with sphagnum peat (at 5 percent, 10 percent and 20 percent ratios), reed sedge peat (at 5 percent and 10 percent ratios), loam (at 2.5 percent, 5 percent, and 20 percent ratios), clay-based porous ceramic (at a 10 percent ratio) and nutrient-charged clinoptilolite zeolite (also at a 10 percent ratio). As expected, initial turf establishment was improved on both organic and inorganic root-zone mixtures with greater nutrient retention. However, greater nutrient retention in inorganic mixtures did not improve turf performance compared to nonamended sand by the end of the grow-in year.

Further study is needed to determine why greater nutrient availability in inorganic mixtures did not result in better turf performance at the end of the grow-in year. It's possible that water availability could be involved in limiting nutrient supply from the inorganic mixtures, since turf response on the inorganic mixtures became similar to the nonamended sand plots as irrigation intensity was reduced. Longer-term study of these root-zone mixtures will verify the persistence of turf responses, especially considering that some of the better turf establishment and performance occurred on mixtures having a capillary porosity considered unacceptable (greater than 25 percent at 30-centimeter water tension) by USGA guidelines.

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