Chapter 1.

Introduction

Ion exchange properties of soils were identified in 1850, and by the end of that century, Dyer (1894) remarked that “the chemical analysis of soils, which in the early days of agricultural chemistry was looked upon as likely to be of very great practical use in agriculture, was soon found to be, as ordinarily practiced, of very limited value.” When turfgrass science research got underway in the succeeding years, soils from turfgrass sites were analyzed, but by 1925 it was said that, when it came to the results, “no one living can tell what they mean” (Anonymous, 1925).

With the 1940’s and 50’s came a rapid expansion of commercial agriculture, analytical technology, and improved understanding of soil acidity and plant nutrient requirements. Concurrent improvements in soil testing methods and interpretation of the results laid the groundwork for more efficient fertilizer use and higher crop yields. However, turfgrass scientists did not then and to our knowledge have not yet conducted wide-scale calibrations of extractable soil nonacid cations to either a turfgrass yield or a performance response. Rather, critical soil values from agronomic or horticultural crops have been adapted for use on turfgrass sites with modifications as deemed appropriate by experienced turfgrass scientists (Carrow et al., 2004).

In addition to the lack of calibration data for turfgrass, there are complications in assessing the nutrient availability of sand rootzones. The available nutrients in sand rootzones are sometimes deemed too transient to warrant testing, and the optimum levels of available nutrients in sand rootzones are less defined than are the optimum levels for clay-containing soils. Furthermore, different extraction methods remove different pools of plant-available nutrients, and in sand rootzones the inherently low nutrient levels result in magnified relative differences between extraction methods.

These differences in extracted nutrients result in varying CEC estimates depending on extraction method. Commercial soil testing laboratories usually estimate CEC by summing the nonacid cations extracted in an agronomic soil test. These CEC estimates are suitable for many soils (Sumner and Miller, 1996), but they are inappropriate for calcareous samples and their suitability for estimating CEC of sand rootzones has not been evaluated.

Turner and Hummel (1992) called for more soil test calibration studies to address the conflicting results of previous work. The variations in turfgrass species, site conditions, management practices, and extracting solutions used in turfgrass nutritional studies have caused this situation. For example, by reviewing experiments on K fertilizer and rooting, one can argue that K increases bentgrass (*Agrostis* spp.) roots (Beard, 1973), or one can argue that K decreases bentgrass roots (Woods, 2004).

Turfgrass managers attempt to provide an optimum playing surface under conditions when the grass is often stressed. If nonacid cations are required, we will do well to identify the sites where they are needed, and to determine how much of a particular nonacid cation should be applied. Conversely, in a situation where nonacid cations are not required, we should be able to identify the adequacy of these nutrients in the soil, and the turfgrass manager can direct attention to more productive practices to improve or maintain the playing surface. Unfortunately, we have insufficient knowledge to make such interpretations of nutrient sufficiency based on the results of soil nutrient or plant analyses.

We began this work to gain a better understanding of different extraction procedures for sand rootzones. We investigated experimental and common soil testing methods for their accuracy in assessing plant-available nonacid cations and for their suitability in sands of varying pH and mineralogy.

References

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