All Things Considered – A USGA Staff Opinion

NUTRITIONISM

Better turf through chemistry?

BY JOHN FOY

Along with advances in equipment, there are many more fertilizer options for feeding turfgrasses.

There are very distinct differences between the basic nutrients needed for plant growth and the foods consumed by humans. However, on the subject of nutrition, there are parallels in the approach of the fertilizer and food industries. These parallels go back to the mid-19th century when the German chemist Justus von Liebig and other scientists studied both plant and human nutrition. Liebig, who is generally credited with being the father of the fertilizer industry, believed protein was the "master nutrient" in animals and likened its role to nitrogen in plants.

Both plant and human nutrition have been and continue to be intensely studied, and many advances have been made in the understanding of these subjects. For food science, the focus has gone far beyond the basics of calories, proteins, fats, and carbohydrates. Foods are being analyzed to determine their most basic components, the nutrients they contain. The list of essential nutrients continues to expand, and there is also regular reporting of new research findings on amino acids, carotenoids, antioxidants, and monosaturated versus polyunsaturated fats.

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The journalist Michael Pollan does not take credit for creating the term, but he does define the obsession with individual components of food as "nutritionism" in his book *In Defense of Food, An Eater's Manifesto*.

Turfgrasses require 17 basic elements to produce their own food and energy for maintenance and growth through the process of photosynthesis. In addition to carbon, hydrogen, and oxygen, the other nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, zinc, copper, molybdenum, boron, chlorine, and nickel. There are well-established guidelines regarding the sufficient levels of available nutrients (SLAN) that need to be supplied through soil reserves or supplemented with fertilizer[1]. Yet, as in the case with food, nutritionism and focusing on individual nutrients far and beyond what is practical or necessary has gained popularity in turfgrass nutrition.

Nutritionism is by no means totally new in turfgrass fertilization. In the mid 1980s, it was reported that increased levels of potassium improved rooting as well as drought and wear tolerance. Increased use of potassium subsequently occurred and has been taken to an extreme in some cases. Potassium's high mobility in soil combined with the sandy soils and high annual rainfall rates that occur in Florida results in a worst-case scenario for maintaining sufficient potassium levels in soil, because much of it is lost through leaching and subsequently wasted. However, is applying 20 to 30 pounds of potassium per 1,000 square feet annually really necessary or cost effective?

Calcium has also received a lot of attention and use in turfgrass fertilization programs. This came about as a result of consultants and fertilizer salesman utilizing the basic cation saturation ratio (BCSR) theory for interpretation of soil test results and to make fertilizer recommendations. This theory is based on maintaining percentages and ratios of calcium, magnesium, and potassium that are thought to be ideal for plant growth as well as soil microbial activity and soil structure. Yet, this theory had not previously been tested with turfgrasses, and the research that has been conducted in recent years has substantiated that it is not valid.[2] Along with the application of calcium, focusing strictly on theoretical ideal percentages and ratios can result in some nutrients still being below sufficient levels in the soil or in some cases far in excess of what is practical for the turf.

Soil testing and proper interpretation of the results are basic components in a sound turfgrass nutrient management and fertilization program. But, as is almost always the case, there are those individuals who take everything to an extreme. Soil test results that report nutrient levels based on both chemical and saturated paste extraction plus the percentage of cations appear impressive when presented in the form of colorful bar graphs and spreadsheets. However, in most situations this is overkill as far as making practical decisions on fertilization and day-to-day turf management.

The same can be said for the growing trend of frequent tissue testing. Indeed, wet chemistry tissue testing provides accurate numbers on nutrient levels. However, this is really just a brief snapshot in time of tissue nutrient content. Readings can vary widely depending on several factors, the most obvious of which are the time of year (because there are seasonal differences in tissue nutrient content) and whether sampling is performed before or after application of fertilizer. Also, there is not a lot of background information on the relevance of the numbers and turf growth responses.[3]

Even more amazing is the recent resurgence in near infrared spectrometry (NIRS) tissue testing. It has previously been documented that NIRS does provide accurate information on leaf tissue nitrogen content, but there is insufficient accuracy when reporting all other nutrients, and thus it does not have a practical use in turfgrass nutrient management at this time.[4]

Another parallel between the fertilizer and food industries is how nutritionism has become an integral part of product marketing. With processed foods, the bad ingredients like cholesterol, trans fats, sodium, and sugars are being eliminated or reduced and replaced with beneficial components like fiber and vitamins. This results in foods that are promoted as being healthier and better for us. The formulation of some fertilizers now goes way beyond supplying the basic macro- and micronutrients. Along with advertising the increased availability of various nutrients, the addition of organic acids, proteins, carbon, carbohydrates, enzymes, and various other compounds that are reported to enhance turf health and growth has become common in product marketing. Yet, there is still not enough unbiased research to support most of the claims being made. Also, there are questions about whether or not the increased costs are justified.

Fertilization is absolutely a key component in turfgrass management. However, sunlight, temperature, moisture, and other factors also play critical roles in turf growth and health, and there are no special nutrients or chemicals that can replace such essential components. Thus, nutritionism alone is not the answer or even a proven approach in sustainable turfgrass and golf course management

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